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Sec. 5, 3 (ii.), on page 7, *should read* :—

ii. Drill. “Infantry Training” to end of Chapter V. ;
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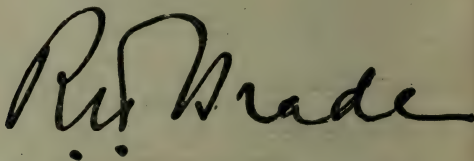
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THIS Manual is issued by command of the Army Council. It deals with the elementary training of Engineers, and with the general principles which are to govern their further training in peace and the employment in war of that arm.

The attention of commanders is drawn to "Training and Manœuvre Regulations," Section 3. Any enunciation by officers responsible for training of principles or practice of methods differing in principle from those laid down in this Manual is forbidden as tending to cause confusion of thought and to prejudice successful co-operation in war.

A large, stylized handwritten signature in dark ink, reading "R. H. Wade". The signature is written in a cursive style with a large initial "R" and a long, sweeping underline.

War Office,
11th December, 1914.

**PRESENTED BY
AUDREY COWLES**

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Howles

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ENGINEER TRAINING.

PART I.

PEACE TRAINING.

CHAPTER I.

GENERAL PRINCIPLES OF TRAINING.*

1. *The object of training.*

1. The immediate object of all training is the preparation of the officer, the man and the unit for the duties which will be required of them in war, and this object must be kept in view in every detail of the instruction.

2. "The full power of an army can be exerted only when all its parts act in close combination."† Engineers assist the other arms by applying the special training which they receive according to the requirements of the military situation. The

* The training of the Signal Service is not included in this Manual, except as regards the dépôt training of recruits.

† F.S. Regs., Part I., Sec. 2.

training of engineers is therefore of a two-fold nature. They must be trained in their technical duties, and their general military knowledge must be so developed that they can apply their technical knowledge effectively. A proper balance must be maintained between these two requirements.

3. The preliminary steps necessary are :—

- i. The development of a soldierly spirit.
- ii. Training of the body.
- iii. Training in the use of rifle and bayonet.
- iv. Training in technical subjects.

4. In developing a soldierly spirit the objects in view are to help the soldier to bear fatigue, privation and danger cheerfully; to give him confidence in his superiors and comrades; to increase his powers of initiative, of self-confidence and of self-restraint; to train him to obey orders, or to act in the absence of orders for the advantage of his unit; and finally to produce such a high degree of courage and disregard of self, that he will do his work in the stress of battle coolly and to the best advantage. As soon as the recruit joins he should be brought under influences which will tend to produce and increase such a spirit, and it is the duty of all officers and non-commissioned officers, by their conversation and example, to exercise their influence towards the attainment of this object.

The soldier should be instructed in the deeds which have made the British army and his corps famous, and this instruction should be extended to simple lessons drawn from military history in general.

The privileges which he inherits as a citizen of a great empire should be explained to him and he should be taught to appreciate the honour which is his, as a soldier serving his King and country.

5. Manly games are of value; especially if such games and competitions are so arranged that all, and not only selected

teams, take their part. Games and competitions should be used to impress the value of combination as well as of individual prowess.

Drill in close order is also an important factor in producing discipline, cohesion, and the habits of absolute and instant obedience to the orders of a superior.

6. The object of the training of the body is to develop in the soldier a capacity for resisting fatigue and privation.

The courses of physical training are laid down in the "Manual of Physical Training," these courses are supplemented by the other training which the soldier receives, both as a recruit and subsequently as a trained soldier.

7. The musketry instruction of the soldier is laid down in "Musketry Regulations," Part I; Instruction in Bayonet fighting is found in Appendix I of "Infantry Training." Instruction in the technical duties of engineers is contained in "Military Engineering," Parts I to VI.

8. The principles on which the further training of the soldier is based are contained in "Field Service Regulations, Part I." The instructions in Part II of this manual are in amplification of those regulations, so far as engineer duties are concerned.

9. It is of importance that the engineer should be made to understand at all periods of his training how the various parts of his course of instruction fit him for his duties in war, and, in particular, the close connection which should exist between the work of the engineers and that of the other arms in the field.

2. General instructions for training.

1. The general system on which the training of the army should be carried out is explained in the "Training and Manœuvre Regulations." The instructions for training in this

manual are based on that system; they are therefore divided into:—

- i. Individual training.
- ii. Collective training.

2. The diversity of employment of the different engineer units, and the varying conditions under which they are trained throughout the Empire make strict adherence to any one system impossible, but the methods described in the following chapters are to be taken as a guide for the progressive instruction of the soldier, and should be followed as closely as the circumstances of each case permit.

3. It is usually undesirable to define exactly how the time available for the various courses of training is to be employed. Commanders should design for themselves programmes of training, which will ensure that the required standard of efficiency is reached within the time allowed.

When the time available for training is very limited or special circumstances call for intervention, detailed instructions may be issued by higher authority for the training of subordinate commands. Detailed instructions, however, tend to cramp initiative, and to increase the work of subordinates rather than to assist them, consequently their issue should be limited to cases in which the need for them is undoubted.

4. All commanders are responsible for the training of the troops placed under their command. Superior commanders will assist and supervise their subordinates, but will not interfere with the methods adopted by the latter unless those methods appear to be unsuitable, or contrary to approved principles.

5. During the period of collective training* engineers should be relieved of their peace administrative duties as much as possible.

* "Training and Manœuvre Regulations," Sec. 4(3).

3. *Training of the Engineers of the Special Reserve and Territorial Force.*

1. The training of units of the Special Reserve and of the Territorial Force should be carried out on the same principles as are laid down in this manual for the regular forces.

Although it is not possible for units of the Special Reserve and Territorial Force, in the limited time at their disposal, to carry out the whole course, the spirit of the instructions should be observed.

CHAPTER II.

INDIVIDUAL TRAINING.

4. *The recruit officer.*

1. The training of the officer may be considered under two headings:—

- i. General military training.
- ii. Special technical training.

These two portions of his training are of equal importance, the one being complementary of the other.

2. The recruit officer's course at the School of Military Engineering is designed to develop his military instincts and to lay the groundwork of his technical training.

It will therefore include:—

- i. The course of general military duties and training laid down for recruit sappers (Sec. 5).
- ii. General theoretical instruction in the tactics of all arms.
- iii. Practical instruction in elementary infantry tactics as laid down in "Infantry Training."
- iv. Fortification, including field engineering.
- v. Construction.
- vi. Survey and reconnaissance.
- vii. Electricity.
- viii. Workshops.

3. The recruit officer must be taught from the first that engineers exist only for the assistance of the principal fighting arms in certain technical matters, in which cavalry, artillery, and infantry are not required to have the special knowledge and skill of engineers.

4. The young officer will be put through a course of riding and driving. He will also go through a course of shoeing and horse management. Before being dismissed he must be able to groom a horse satisfactorily, put on a shoe, strip and put together a saddle and set of harness, harness a horse, and drive in a team.

5. *The recruit sapper and pioneer.*

1. The training of recruits should begin immediately they join, and should be carried out under carefully chosen officers and non-commissioned officers. The course for the recruit may be considered under the following headings:—

- i. The test of trade.
- ii. Military duties and training.
- iii. Musketry.
- iv. Field works.

The whole course will occupy about 29* weeks.

2. On joining, all dismounted recruit sappers will be tested at their trade in accordance with "Royal Engineers—Corps Memoranda."

3. The course in military duties and training will include:—

- i. The development of a soldierly spirit.
- ii. Drill. "Extracts from Infantry Training, 1911," Part III, 1 (Sections 82–86), and Part III, 2 (Sections 93–99); "Infantry Training, 1914," Chapters II and V; and "Ceremonial," Parts III, IX, and X, as far as they are applicable.
- iii. Physical training, as laid down in the "Manual of Physical Training."
- iv. Instruction in routine duties, cleanliness, smartness, orders, and the necessary regulations.

* This refers to the sapper enlisted for general service and to pioneers. Sappers enlisted for telegraph or coast defence duties, or as mechanical draughtsmen, undergo a shorter field works training. See Sec. 5 (6) and (7).

- v. Route marching and march discipline.
- vi. Instruction in the care of arms ("Musketry Regulations," Part I).
- vii. Visual training and ranging ("Musketry Regulations," Part I).
- viii. Elementary training in night operations (*see* "Infantry Training").
- ix. Semaphore signalling.
- x. Swimming and hygiene.

In each of the above subjects the recruit must reach a satisfactory standard prior to joining his service unit, and the standard should be such that the recruit will be able to benefit by the further instruction which he will then receive. The time available for the above training will be from 9 to 13 weeks.

4. The musketry course is laid down in "Musketry Regulations," Part I.

5. The object of the recruits' field works course is to train the recruit in such field works duties as will be required of a sapper or pioneer, as distinct from a non-commissioned officer, when he joins his service unit. The recruits' field works course is only the ground work of his future training with his service company. Therefore during the recruits' course each individual recruit must be thoroughly grounded in the following:—

- i. Field entrenchments and the use of entrenching and cutting tools, the field level, and elementary field geometry.
- ii. The working of brushwood into fascines, gabions, hurdles, revetments, &c.
- iii. Construction of loopholes, and overhead cover.
- iv. Knotting, splicing, and lashing.
- v. The use of blocks and tackles.
- vi. The constructional work connected with the use of spars, trestles both framed and lashed, and hold-fasts.

- vii. Rowing.
- viii. The construction of cask and boat rafts and piers.
- ix. Pontooning, the working of the service trestle, and use of anchors.
- x. Water supply apparatus and requirements.
- xi. Obstacles.
- xii. Sapping and mining.

He should be given elementary instruction regarding the following:—

- xiii. Demolition, connecting charges, and the precautions to be taken in handling explosives.
- xiv. Engineer duties in connection with billets, bivouacs, and camps.
- xv. Railways and telegraphs, their construction and destruction.
- xvi. Road making and repairing.

The period available for this training will be 16 weeks in the case of sappers enlisted for general service and for pioneers of field companies. The time should be apportioned between the various subjects so as to meet the requirements of the individual recruit, and to ensure that he be thoroughly grounded.

6. Sappers enlisted as line telegraphists will be put through a field works course of 30 working days. The subjects mentioned in subheads vii, xi, and xii of para. 5, should be omitted in their case. Other recruits of the signal service do not go through a field works course.

7. Men selected for training as coast defence sappers and mechanical draughtsmen will be put through a modified course of 11 weeks. These men will subsequently undergo specialist courses as directed in "Royal Engineers—Corps Memoranda."

8. The daily programmes of work should be arranged with as great a variety as possible, and must be suited to the aptitude of the individual recruit, every endeavour being made to guard against monotony, with its consequent loss of interest.

6. *The recruit mounted sapper.*

1. The recruits' course for mounted sappers will include:—
 - i. The test of trade.
 - ii. Military duties and training.
 - iii. Musketry.
 - iv. Field works.
2. The trade test will be carried out in accordance with "Royal Engineers—Corps Memoranda" as soon as the recruit joins.
3. The course in military duties and training will include:—
 - i. The development of a soldierly spirit.
 - ii. Squad drill, with and without arms; *see* "Infantry Training."
 - iii. Physical training.
 - iv. Instruction in routine duties, cleanliness, smartness, orders, and the necessary regulations.
 - v. Riding drill, stable management, and the care of horses.
 - vi. The care of arms, visual training and ranging. ("Musketry Regulations," Part I.)
 - vii. Field works.
 - viii. Swimming.
 - ix. Hygiene.
4. The time available for instruction in the subjects mentioned in paragraph 3 (with the exception of subheads vii and viii) will be from 9 to 13 weeks.
5. The musketry course is laid down in "Musketry Regulations," Part I.
6. The field works course will usually occupy about 16 weeks. The subjects to be taught in the field works course for recruit mounted sappers, and for lance-corporals (driver class), field squadron and of field troops on first appointment, will be those detailed in Sec. 5, paragraph 5.

The object of the course is to train the recruit in such work as will be required of a mounted sapper, as distinct from a non-commissioned officer. This course is only the groundwork of his future training with the field squadron and field troop. Each individual recruit should be thoroughly grounded in his work as a sapper in each of the subheads of paragraph 5, Sec. 5, except that the instruction in subhead xii may be more cursory.

7. Swimming will be taught during the field works course. Mounted sappers will be taught mounted drill (*see* "Cavalry Training") and semaphore signalling, after joining their service troops.

7. *The recruit driver.*

1. The recruit driver's course will include—

- i. The development of a soldierly spirit.
- ii. Squad drill, with and without arms. (*See* "Infantry Training.")
- iii. Physical training.
- iv. Instruction in routine duties, cleanliness, smartness, orders, and the necessary regulations.
- v. The care of arms, visual training, and ranging.
- vi. Riding drill.
- vii. Driving drill.
- viii. Recruits' course of musketry.
- ix. Swimming.
- x. Hygiene.

2. The recruits' course will be divided into three distinct periods:—

- i. Foot drill, lasting about 6 weeks, and musketry, as in "Musketry Regulations," Part I.
- ii. Riding drill, lasting about 6 weeks.
- iii. Driving drill ,, ,, 4 ,,

3. Stable management and the care of horses should be taught progressively throughout the whole of these three periods; during the first period he should be taught principally stable routine and elementary horse management; during the second period he should be taught by lecture and practice how to look after one horse and one set of saddlery, and should be instructed in elementary horse-mastership; during the third period he should be taught to take sole charge of a pair of horses and a double set of harness.

Physical training should be continuous during the first and second periods.

During the whole period he should be given lectures from "Animal Management."

8. *The individual training of officers, N.C.Os., trained sappers and pioneers.*

1. The importance of the individual training of the officers and non-commissioned officers cannot be overrated. Throughout the year every opportunity should be taken to further this training and to prepare officers and non-commissioned officers by practice, reading and observation for the problems by which they may be confronted in war (*see Part II*). Special opportunities for such training will occur during the winter months, which are not occupied by collective training, but opportunities will also occur during the intervals of collective training.

2. During the winter months non-commissioned officers and men should be given every opportunity to improve their trade and other qualifications, efficiency as a tradesman being an important qualification of a good sapper. Officers and non-commissioned officers should be exercised in map reading. The number of signallers required for the unit, together with a proportion of spare men to replace casualties, should be trained. All non-commissioned officers and 25 per cent. of sappers and pioneers should be trained in semaphore signalling. Riding

and driving should be practised in mounted units. Whenever facilities exist or can be improvised the entraining, detraining, embarking, and disembarking of personnel, horses, vehicles and stores should be practised.

3. The senior officers should, whenever possible, attend the divisional or brigade staff tours. Regimental exercises (*see* "Training and Manœuvre Regulations") should be organised, having for their object the solution, on the ground of tactical, engineering or administrative problems, similar to those which may have to be solved in war by the officers concerned. These exercises, which should be carried out by the officers and non-commissioned officers on the strength of units, should be arranged with the special object of training junior officers and non-commissioned officers in detached or individual duties.*

The problems to be considered during regimental exercises should be based upon the principles contained in Part II. Amongst such problems are the following:—

- i. The engineer work in connection with an advanced guard or rear guard.
- ii. The work of an engineer unit attached to a force carrying out an attack over a selected piece of ground.
- iii. Assisting the other arms in the preparation of a position for defence.
- iv. River crossings and bridges of all kinds.
- v. Engineer work in connection with the quartering of a given force.
- vi. Engineer work in the preparation for defence of a post on the lines of communication.
- vii. Improving facilities for disembarkation at a port or on a beach.

* This training need not be confined entirely to any particular portion of the year.

- viii. Engineer work in the attack of a fortress, the preparation of field dépôts, workshops, &c.
- ix. Siting light railways or tram lines, improvising platforms, &c., for the detraining or entraining of a given force.
- x. Engineer reconnaissances of all kinds.

All this instructional work should be carried out in accordance with a scheme referring to the operations of a body of troops. It will probably be necessary to prepare a special idea for each day's work, and it should be clearly explained how the engineer work to be executed depends on the orders of the commanders of the force and on the situation thus created.

Much of this work may with advantage be carried out in conjunction with the regimental exercises of the other arms. (*See "Training and Manœuvre Regs."*)

Junior officers and non-commissioned officers should be practised in formulating quickly plans and proposals for dealing with a given situation. They should be called upon to calculate in a given time the strength of the working parties, the number of tools, and the amount of material and stores required, stating where the latter are to be obtained. Their proposals should be criticised on the ground, whenever possible.

CHAPTER III.

COLLECTIVE TRAINING

9. *The object of collective training.*

1. The object of collective training is to perfect the training of the unit so as to enable it to take its place in the higher formations to which it is allotted in war.

2. Collective training will be carried out first by the troops and companies working alone, and later in conjunction with other arms. The collective training, not in conjunction with other troops, should be arranged so as to practise the commissioned and non-commissioned ranks in the design, execution, and organization of their special technical work, and in their general military duties. The object of collective training with other troops is to familiarise all ranks with the working of the other arms, so as to ensure co-operation and mutual understanding between all branches of the service.

10. *The conduct of collective training.*

1. At home stations the period for collective training begins on March 1st, and ends on October 31st. At stations abroad the training season is arranged by the general officers commanding to suit local conditions.

The season may conveniently be considered under three periods as under:—

- i. The first two months may be allotted to elementary military training.
- ii. The next three months to special technical instruction.
- iii. The last three months to the application of (i) and (ii) to combined operations.

2. In every unit the subaltern officers should be made responsible for a troop, half-troop, half-company, or section, as the case may be, and every effort must be made to develop their initiative and sense of responsibility.

3. The training of individuals and units is not to be considered as limited to any particular period. Advantage must be taken of any opportunities which may arise for individual training during the period for collective training.

4. Throughout the period of collective training, all forms of night work should be practised by the unit, both alone, and also when working in conjunction with the other arms.

5. The instructions for training in march discipline in "Infantry Training," Section 112, are to be followed during all periods of training.

11. *Training with the other arms.*

1. The training of engineer units with other arms, which is the foundation of effective co-operation, should not be confined to the period usually allotted for the training of the higher formations. Some engineers should frequently accompany battalions or infantry companies during their training. Commanders of engineers should take every opportunity of co-operating in the tactical schemes carried out by the other arms quartered at their station during the training period.* A previous knowledge of the plans for the training of a unit will enable the commander of engineers to suggest co-operation in those schemes in which engineers might usefully participate. This previous knowledge of the scheme, and of the ground over which it is to be carried out, is essential, as the limitations of the training ground often render it impossible for engineers to co-operate usefully in peace training, though they might be

* This applies to all engineer units.

employed in similar circumstances in war. In such cases, however, much useful instruction may be gained if engineer officers and non-commissioned officers accompany the troops concerned to study the services which they might be called on to perform. In this connection it must be remembered that the work of engineers in war is either destructive or constructive; from its very nature it involves a considerable expenditure of time and money, both of which factors militate against the reproduction of war conditions on manœuvres with sufficient reality. Care must therefore be taken to guard against the formation of erroneous impressions as to the part played by the engineers in battle.

2. The distribution of troops to their work should be practised in peace and the responsibility for work must be clearly defined. Generally speaking engineers will have to work under one of the two following conditions:—

- i. When they work in conjunction with a force, of all arms, under the commander of that force.
- ii. When troops of other arms are placed under an engineer officer responsible for a given undertaking.

In the first case the commander of the force after such consultation with the engineer officer as he might think necessary, would decide the work to be executed by the different portions of the force. Each portion should be given a distinct task to carry out. The engineers would either be allotted distinct tasks, with additional labour as necessary, or would be distributed by the commander to assist in the execution of the work. The work which should be given to them in various cases is indicated in Part II.

In the second case the engineer officer would give a distinct task to the officer in charge of the working party, and the latter would be responsible to him for its execution.

12. *The collective training of a field squadron.*

1. During the first period of training (*see* Sec. 10) the troop commanders will instruct their troops in—

- i. Drill.
- ii. Dismounted action.
- iii. Engineer reconnaissance.
- iv. Musketry.

2. During the second period the squadron will be instructed in field works. The subjects forming the course of field works are given in Appendix I. The squadron should be exercised in the subjects given, with the exception of those dealing with fortress warfare and mining. The construction of railway, tension or suspension bridges may also be omitted. In addition to the subjects laid down in Appendix I, the course should include—

- Swimming horses.
- Rowing.
- Felling and sawing timber.
- Hasty bridges.
- Landing stages.

The course will last about 9 weeks, during a portion of which the squadron will proceed into camp in order to carry out those portions of the course which cannot be carried out advantageously in the vicinity of its station.

3. During the second period the pioneers of cavalry regiments will be attached to the field squadron for a 3 weeks' course in field engineering.

4. The second period should be completed before the beginning of cavalry brigade training.

5. During the third period the squadron will be trained under the orders of the cavalry divisional commander.

12A. *The collective training of a field troop.*

The collective training of a field troop will be conducted on similar lines to that of a field squadron.

13. *The collective training of a field company or bridging train.*

1. The first period of the training (see Sec. 10) should include:—

- i. Drill of mounted and dismounted men.
- ii. Field training of dismounted men as an infantry company.
- iii. Musketry, visual training, ranging, &c.
- iv. Engineer reconnaissance and map reading.

2. The second period should include field works, pontooning or heavy bridging, and training with other arms.

The subjects forming the course of field works are given in Appendix I. The course will last about six weeks.

In addition to the course of field works, field companies and bridging trains will carry out an annual course of instruction in bridging.

This course, which will last about 2 weeks, will be spread over a period of three years as follows:—

1st year—pontooning (not necessarily in a tidal river).

2nd „ — „ (in a tidal river).

3rd „ —heavy trestle bridging in a suitable locality.

The order in which the successive year's training is carried out is immaterial, so long as each field company carries out the prescribed courses within the period of three years.

3. The programme of the field works course will depend on whether pontooning or heavy trestle bridging is to be carried out later. All portions of the field works course which involve entrenching should, whenever possible, be carried out in conjunction with infantry. The allotment of work between the

various arms should be governed by the principles contained in Part II. The field works course should be arranged not only to train the individual sapper in his duties, but also to practise the junior officer and the non-commissioned officer in the design and execution of work, in the tactical application of all forms of field defence, and in the handling of working parties.

4. Pontooning, the use of the service trestle, and all kinds of floating bridges, form an important part of the training. The selection of suitable sites for bridges in connection with a tactical scheme must be practised by officers and non-commissioned officers. Mounted men should be taught to row, and be given some instruction in pontooning. Horses must be trained to cross bridges by day and by night, both when led and when hooked in, and must also be practised in swimming. Bridging by night must be practised, silence and celerity being aimed at.

5. The first and second periods of training should be completed before the beginning of brigade training. The third period will be carried out under the orders of divisional commanders.

14. *The collective training of a railway company.*

1. The commander of the railway companies will be responsible under the G.O.C.-in-C. of the command in which the companies are quartered, for the training of the companies, but latitude should be allowed to the commanders of each railway company in framing his programme.

2. During the first period of the training (*see* Sec. 10) the instruction should be the same as that given for a field company (*see* Sec. 13).

3. The subjects forming the course of field works are given in Appendix I. The course, which will last about 3 weeks, will be modified for railway companies, fortress warfare, mining and all bridging, except spars and hoisting gear and railway bridges, being omitted.

4. During the remainder of the period the railway company will be trained for its railway work, the training being on the basis that railway companies are required to survey, construct, repair and demolish railways, and to work construction and armoured trains.

5. The "working" of an existing railway, *i.e.*, the traffic and locomotive work on an open line, will seldom be required of a railway company in war time. For such work larger and differently organized units are necessary; consequently the training of railway companies is not designed with a view to affording practice in "working" open lines, but to give training in the duties specified in para. 4. When, however, a railway has been made, practice may be given in working it for a short time, after which it should be taken up and relaid with variations in the types of bridges, signals, water supply, station yards, &c., &c.

6. The training should, therefore, be generally on the following lines:—

- i. Every company officer should carry out a reconnaissance of 35 to 40 miles of lines. Selected officers with parties of N.C.Os. and men under survey training should carry out about 10 miles of preliminary survey and five miles of final location. Complete plans and sections to be made. Selected N.C.Os. and men in each company to be instructed in the use of the tacheometer and level, and taught sufficient to enable them to lay out a deviation and to make a section of the same.
- ii. Not less than 15 miles of main line permanent way with one loop siding to be laid continuously without any interval devoted to other work by the party detailed for the purpose; speed in platelaying to be aimed at.
- iii. Problems in platelaying of station yards to be worked out and executed.

- iv. Problems in laying out deviations, to replace broken bridges temporarily, to be worked out practically.
- v. The rapid laying of temporary narrow gauge tramways for hand-pushed trollies.
- vi. Bridging of all kinds to include:—
 - Trestle bridges, high and low.
 - Crib bridges.
 - Pile bridges.
 - Sinking cylinders.
 - Erection of girders.
 - Repair of girders.
- vii. Signal installation.
- viii. Water supply, temporary and permanent, including various methods of procuring and delivering water.
- ix. Repairs to telegraphs, such telegraph and telephone construction as may be required for working the line under construction. Working of electric block instruments.
- x. Armouring engine and trucks, fitting armoured trucks with searchlights and telephones.
- xi. Construction of temporary platforms.
- xii. Working and maintenance in repair of construction trains required for above services.

15. *The collective training of a fortress company.*

1. The establishment of a fortress company, and its duties, being variable according to the requirements of the fortress at which it is stationed, it is not possible to lay down one system of training applicable to all throughout the whole period. But all companies, whether with a works establishment only, with an electric light establishment only, or with a combined establish-

ment, will during the first period be put through a course of training, including the following:—

- i. Drill and field training as an infantry company.
- ii. Musketry, visual training, and ranging.
- iii. Signalling.
- iv. Engineer reconnaissance and map reading.

2. All companies will, during the second period, be put through a course of field* works. The subjects forming this course are given in Appendix I. The course will last about six weeks.

3. Fortress companies with a works establishment only should be specially trained for such duties as may be required for the defence of the fortress in which they are quartered. These duties include both those required of a company in connection with the actual defence of the fortress, and those connected with any operations outside the fortress in which the company is likely to be employed. The officers must be acquainted with their duties on the order being given for the fortress to be put in a complete state of defence, subject to such conditions as regards secrecy as may be imposed by the fortress commander.

4. Companies with an electric light personnel† only will, in addition to the training mentioned in paras. 1 and 2 above, carry out the following special training:—

- i. Electric light training—

Weekly electric light practice with one or more lights should be carried out throughout the year. Each practice to count as a half-day; total, 25 days a year.

* Certain companies will be ordered to specialise in siege works.

† Throughout the year all specialists and electric light manipulators should be given theoretical and practical instruction, designed to give them higher theoretical and practical knowledge in the branch of work for which they have been trained. One half-day a month should be given to this instruction.

Annual training (and weekly practice also, whenever possible) should coincide with the manning of the fortress by the garrison, and should be worked in conjunction with the naval authorities.

All lights will be manned, and the training should be carried out in two periods, one in winter and one in summer.

ii. Inter-communication—

All telephone offices for which the engineers are responsible should be manned at the annual defence exercises. The engineer command lines in connection with electric light should also be manned at the weekly practices.

5. Fortress companies with a mixed establishment will be trained in accordance with the above paragraphs, their electric lights personnel being trained as in para. 4.

6. Combined training with other arms will, whenever feasible, be carried out in accordance with the principles in Sec. 11.

16. *The collective training of a survey company.*

1. A survey company will fire the same musketry course as a fortress company (*see* Sec. 15), biennially.

2. Every alternate year it will be put through a modified course of field works. The subjects forming this course are given in Appendix I., being modified in this case by the omission of fortress warfare, heavy and floating bridges, and railways. The course will last about three weeks.

3. During the rest of the year a survey company will be employed at its technical work under the Director-General of the Ordnance Survey, who is responsible for the training mentioned above.

4. The personnel required for the field survey sections will be found from the survey companies. Young sappers who

appear likely to become useful topographers will be put through a course of preliminary training in topography lasting 15 days. Trained topographers will go through an annual course of advanced topography until they reach the age limit of thirty-five. The details of the topographical surveyor's test are given in "Royal Engineers—Corps Memoranda." The lithographers of the section will be employed at their trade throughout the year.

CHAPTER IV.

EQUITATION AND DRIVING.

17. *The standard required.*

1. Horsemastership is a necessary qualification for all commanders of mounted units. Every section commander in a mounted unit should be capable of instructing his men in horsemastership.

2. The qualifications of a good horseman are as follows:—

He should have a strong seat, quite independent of the reins; in this way alone can he have good hands.

He must understand and be able to apply correctly the “aids” by which the horse is controlled.

He must be a good groom, have a practical knowledge of the care of horses both in barracks and in the field, and must understand how to detect and treat the minor ailments to which horses are liable.

He should be able to cover long distances on horseback with the least possible fatigue to his horse.

He should, if a driver, be able to drive a pair of horses in any position in a team and make them do even work, without distressing them. He should also be able to get a fallen horse out of harness or out of a ditch.

18. *Horsemastership.*

1. *General instructions.*—The importance of being a good horsemaster should be impressed upon the mind of every mounted man from the moment of his joining. He should understand that the efficiency of any body of mounted troops on service depends first and foremost on the condition of each horse.

The recruit should receive careful instruction in the prevention and cure of the minor ailments of a horse, in his feeding and watering, and in his treatment on the march, in the field and in quarters. (*See also "Animal Management."*)

2. *Watering*.—Men should be impressed with the importance of watering their horses when opportunity offers, particularly on hot days. Many a horse has died on service through his rider not taking, perhaps, the only available chance of giving him water during a long day. Horses which are accustomed to be watered in buckets drink slowly at a shallow stream, and consequently they should be given plenty of time. They never suffer ill-effects from being watered when heated, unless they are put to very severe exercise soon after it or are left to stand and get chilled.

Most horses will benefit from water being available in their stalls.

3. *Feeding*.—Every opportunity should be taken when on service, or on a long march or field day to allow the horses to water and feed. Even a few mouthfuls of grass during a five minutes' halt are beneficial.

3. *Weight off the back*.—Even the lightest driver is a heavy burden (generally more than 11 stone including the saddle), and every minute that weight is removed from the horse's back is a refreshing period of relief.

Instructors should impress this on recruits by frequently making them dismount for a few minutes at a time, so that it may become second nature with them to dismount and walk a good deal, especially down hill, if they should be called upon to work alone at any time. It should hardly ever be necessary for a man to remain on his horse at the halt.

4. *Off saddling*.—The two most frequent causes of sore backs are:—(i) Continued friction on one spot; (ii) the stoppage of the circulation by continued pressure. Either of

these is liable to occur if the saddle is left on for hours without being shifted or the girths slackened.

The "off saddle" can be effected very rapidly by all out-riders if it be regularly practised. It is advisable in warm weather to off saddle once a day on the drill ground, or in the open country, whenever the horses are absent from their stables for any length of time. When the saddles are removed, the backs should be immediately slapped, or massaged by means of the flat of the hand for a few minutes, with steady pressure against the direction of the hair, in order to restore circulation. In cold weather, the girths only should be slackened, and the saddle shifted, as its removal may result in a chill.

Every opportunity for loosening the girths and shifting the saddles of draught as well as of riding horses should be seized. Such action relieves the horse in the same way that the removal of a tight boot does a man.

5. *Shoeing*.—From the first men should be taught to pay attention to their horse's shoes, both in stables and in the field. The least sign of a shoe loose or clinches broken or knocked up should be reported and put right without delay.

A shoe lost in the field is a reflection on the man in charge of the horse as well as on the section or half-troop commander and farrier.

6. *Rolling in the sand*.—Nothing freshens a horse more than a roll in the sand, and a sand bath in barracks is most useful for teaching horses to roll in when sweating. The bath should be about 20 feet square, with sand 1 foot deep. A handful of sand poured over the back often induces a horse to lie down and roll.

After rolling, any sand remaining on the horse's back must be removed before he is again saddled.

19. *The paces of the horse.*

1. The following are the regulation paces for drill and manœuvre:—

Walk 4 miles an hour, at which rate 117 yards are passed over in one minute, or $\frac{1}{4}$ mile in 3 minutes 45 seconds.

Trot 8 miles an hour, at which rate 235 yards are passed over in 1 minute, or $\frac{1}{4}$ mile in 1 minute 52 seconds.

2. The canter, about nine miles an hour, and the jog or slow trot, 6 miles an hour, should be constantly employed, both in teaching recruits to ride and in training young horses. Horses should always be made to walk up to the regulation pace of 4 miles per hour.

3. In marching, especially along a road, and when men are riding singly or in small groups not at drill the pace should seldom exceed a jog trot.

20. *Terms used in equitation.*

1. "*Right rein*" and "*Left rein.*"—A horse is said to be on the "right rein" when he is going round the school to the right, or on a circle to the right. The term "left rein" is used when he is proceeding to the left in a similar manner.

To avoid confusing the pupils the instructor as far as possible should use the terms "Right" or "Left" instead of "Outward" or "Inward" when giving explanations.

2. "*The true canter*" is a pace of three time. The legs of the horse should move in such a manner that whichever fore leg leads, the hind leg on the same side must also lead.

3. "*Cantering or galloping disunited.*"—When a horse is cantering or galloping in such a way that the leading hind leg is on the opposite side to the leading fore leg, *e.g.*, when he leads with the off fore and near hind legs, he is said to be "disunited." It is a common fault with bad riders in changing the bend of their horses to allow them to change their fore

legs, but not their hind legs. This results in the horse going "disunited," a faulty action which should not be allowed.

4. "*Cantering or galloping false.*"—A horse is said to be cantering or galloping false, when at the canter or gallop he turns or goes on a circle to the left with the off fore and off hind leading, or to the right with the near fore and near hind leading.

5. *Balance.*—A riding horse on the move is said to be balanced when he carries his head and neck in the right position for balancing his weight and that of his rider.

6. *Collected.*—A horse is said to be collected when he is made to bring his limbs properly under him so that he has the maximum control of them. The collected paces are the school or regulation walk or trot and the canter. The extended paces are the walk out and the trot out.

FITTING SADDLERY.

(See also "Animal Management.")

21. *How to fit a saddle.*

1. The four main points in saddle fitting are :—
 - i. The withers must not be pinched nor pressed upon.
 - ii. There must be no pressure on the horse's spine.
 - iii. The blade-bones must have free and uncontrolled movement.
 - iv. The weight must not be put on the loins, but upon the ribs through the medium of the muscles covering them.
2. In fitting a saddle the bare tree should first be placed on the back, so that the front arch is above the hollow behind the shoulder.

The arch and seat should be clear of the spine. This is not always possible with horses possessing high withers, but it is desirable in order to ascertain the fit of the side bars.

The front arch must be wide enough to admit the hand on either side of the withers, and its points must clear the ribs.

The side bars must not be too long and must bear evenly on the back, or as nearly so as possible. Care must be taken that their edges do not press the withers or ribs.

3. The numnah pannels are then fitted on and the tree replaced on the back, but without a blanket.

The proper thickness of the blanket having been estimated, it is folded and placed on the horse's back with the tree on it. The blanket must be pressed up well into the front arch, and before girthing up it should be noticed whether the burrs are off the shoulders and the fans off the loins; if they are not, the thickness of the blanket beneath the *side bars* must be increased by turning it up on either side. The girths are now pulled up and a man placed in the saddle.

4. First ascertain that the withers are free from pressure. The hand must readily find admission beneath the blanket and over the top and along both sides of the withers. To make the test effective the man should lean forward, and the examiner must not be satisfied with anything less than the introduction of his entire hand.

Then see that blade-bones are free from pressure. This is done by passing the hand beneath the blanket to the play of the shoulder. It should be possible to advance the horse's foreleg to its full extent without the examiner's fingers being pinched between the blade-bone and side bar, even if the man is leaning forward in the saddle. If the fingers are pinched the blade-bone will also be pinched, and the saddle must be raised by fitting thicker numnah pannels on the side bar or an extra fold of blanket.

5. Then ascertain whether the pressure of the side bars is evenly distributed. The saddle, having been ridden in for about half an hour, is carefully ungirthed, and the tree lifted from the blanket without disturbing it. The blanket will be

found to bear the imprint of the side bars, and an examination of it will show at a glance whether they are pressing evenly from top to bottom and from front to rear.

The examination must be made without delay, as the elasticity of the blanket soon causes it to lose the impression of the side bars.

If there is a deeper impression on one part of the blanket than elsewhere, the pressure is not evenly distributed, and a sore back is liable to result.

Irregularity in the fit of the side bars may be remedied by the introduction of pieces of numnah to fill up the space between the side bars and blanket.

In peace these strips of felt can be fixed in position with glue, but in the field they may have to be tied on, or secured with tacks, or best of all, bound in position by means of a piece of leather (basil) which can be tacked to the edge of the side bar or laced with string across the top.

By means of these strips of felt radical alterations in the fit of a side bar can be effected in a few minutes by a man who has no technical skill.

22. *Saddling.*

1. The *saddle* should be placed on the horse's back, in such a manner that the front of it is so much behind the withers as not to interfere with the play of the shoulder.

The fans should clear the back, and the front arch should clear the withers to the breadth of not less than 2 fingers when the rider is in the saddle. The saddle, to afford a suitable seat for the rider, should have a level bearing on the horse's back.

2. The *blanket* is not to rest on the horse's withers, but should be slightly raised by placing the hand under it.

It can be folded in several ways. With a horse of normal shape and condition the following method is recommended:—The blanket is folded lengthways in three equal folds, one end

is then turned over 24 inches, and the other turned into the pocket formed by the folds; the blanket thus folded is placed on the horse's back with the thick part near the withers. Size when folded 2' 0" \times 1' 8", when unfolded 5' 5" \times 4' 8". The folding of the blanket may be modified to suit special horses and to meet alteration in shape consequent upon falling away in condition, or from other causes. In the case of a horse which has fallen away in condition, and for certain shapes of back, a useful method is the "Channel fold." The blanket is folded lengthways in three equal parts, each end is then turned over and folded towards the centre (two or three folds may be taken as required to suit the horse's back), leaving a channel in the centre.

3. The *girth* should be sufficiently tight to keep the saddle in its place and no tighter. In saddling a horse, the girth must be tightened gradually, and not with violence. It is recommended that the girths of all except young and growing horses should be fitted with the buckle in the second or third hole from the free end of the tab.

4. The *surcingle* should lie flat over the girth, and be no tighter than it.

5. *Adjustment of the "V" attachment.*—The V attachment fitted to the saddle as issued, admits of limited adjustment to suit the conformation of the horse.

The front straps of the V attachment, Marks II and III, should not be buckled and unbuckled daily when girthing, nor utilised for shortening or lengthening the girth.

The normal position of the attachment is with the buckle in the centre hole of the three—6½ inches from the rivet—this position will suit a very large number of horses; the upper and lower holes are provided for the adjustment; additional holes are not to be punched.

On animals with straight shoulders that carry the saddle too far forward, the strap should be buckled in the lower hole.

On animals that have deep chests and sloping shoulders, and are thick in front of the saddle, the front strap should be worn long.

But in no case is it to be worn as a true V, *i.e.*, the front and rear straps of equal length, which would depress the hinder part of the saddle, and cause other difficulties.

Care should be taken in all cases to buckle the near and off straps in corresponding holes.

23. *Bridling.*

1. Care should be taken to fit each horse with a bit of the proper size. A narrow bit pinches the horse's lips and a wide bit is apt to move from side to side and so bruise the horse's lips. The bit should be fitted so that the mouthpiece is one inch above the lower tusk of a horse, and two inches above the corner tooth of a mare.

This can only be laid down as a general rule as so much depends on the shape and sensitiveness of the horse's mouth and on his temper.

2. The *curb chain* should be laid in the chin-groove, and be so adjusted that when the bit is pulled back to its greatest extent the angle which the bit forms with the mouth should never exceed 45° even with the lightest-mouthed horse, and should vary between that and 30° according to the degree of hardness of the mouth. The curb should be fixed permanently on to the off curb-hook. It should be adjusted by twisting it to the right, putting the last link on to the near curb-hook, and then taking up as many more links as may be necessary. It should admit two fingers easily between it and the jawbone.

3. The *headstall* should be parallel to and behind the cheek-bone.

4. The *noseband* should be the breadth of two fingers below the cheek-bone and should admit two fingers between it and the nose.

5. The *throat lash* should fit loosely, being only sufficiently tight to prevent the headstall slipping over the horse's ears.

6. The *bridoon rein* should be of such a length that, when held by the middle, in the full of the left hand, with a light feeling of the horse's mouth, it will touch the rider's waist.

24. *Method of putting on head rope, &c.*

1. The *head rope* is put on as follows:—The point of the rope is passed through the lower ring of the jowl piece from the near to the off side, and then through its own ring. It is next passed over the horse's neck from the off to the near side, and fastened off by doubling back the end, and laying the loop so formed on the standing end of the rope six inches from the ring. The free end is then wound round the three returns, passed through the loop, and the loop is hauled taut to it. The number of times the free end is wound round the returns will vary according to the length of the horse's forehead.

2. The *wallets* (officers only) are to be placed on the pommel of the saddle with the hollowed side of the connecting piece to the front. The wallet strap is to be passed from the rear through the rearmost staple on the saddle, then through the rear keeper of the wallet, next through the front staple of the saddle, and finally through the front keeper of the wallet and buckled, the point of the strap pointing to the rear, the buckles being in line with the front edge of the wallet.

3. The *sword frog* is attached to the rear arch of the saddle on the near side, the girth being passed through the steadying strap.

4. The *breast piece* should hang horizontally from the supporting straps, the bottom of it about one inch above the point of the shoulder, and should admit the breadth of the hand between it and the horse's chest.

5. The *breastplate* should be so fitted that the upper edge of the rosette or leather is the breadth of three fingers above

the sharp breast bone. It should admit the breadth of the hand between it and the flat of the shoulder, and also between the martingale (when used) and the horse's chest.

6. The *martingale* should be used only for exceptional horses. It may be either running or standing, according to which suits the horse best.

It should be of such a length that it will not interfere with the horse until he gets his head above the proper position. If it is shorter than this it will tend to make him set his head and neck, and lean against it.

If a running martingale is used on reins other than those sewn to the bit or bridoon they should be fitted with "stops" to prevent the rings of the martingale getting caught by the buckles or studs, which fasten the reins to the bit or bridoon.

The standing martingale should, as a rule, be fastened to the noseband, but under exceptional circumstances it may be fastened to the bridoons or cheek of the portmouth bit.

TEACHING RIDING.

25. *General instructions.*

1. The instruction should be divided into three periods, and the pupil should be gradually advanced from one to the other.

The proper sequence of instruction is a matter of great importance, in order to obtain early and satisfactory results and to avoid spoiling horses.

2. The *first period* should be devoted to the attainment of a firm seat independent of the reins, and its natural consequence—suppleness of the body from the hips upwards. Individual instruction should be the rule during this period.

It is important to give the recruit confidence from the first, so at first he should be given a quiet, well-trained horse. He should be allowed a saddle and stirrups for the first few days, after which some of his work each day should be without

stirrups. The greater part of the instruction at this stage should be without reins, and the principle observed that when the pupil has reins he should also have his stirrups. This procedure saves the horse's mouth and makes it easier for the pupil to control him.

As soon as the recruit begins to be at home in the saddle and can rise in his stirrups, cantering and jumping should commence.

Before he enters the second period the recruit should be able to control his horse in straightforward movements and simple turns in the school or manège and be able to ride over low jumps at all paces without reins. From now onwards a considerable portion of the work should be outside the riding school.

3. This *second period* should be devoted to teaching what are called the *aids*, i.e., the use of the hand and lower part of the leg and of the distribution of the rider's weight to indicate the rider's will to his horse.

The instructor should aim at cultivating freedom and elasticity in the shoulders, arm, and wrists. Stiff shoulder action cramps the play of the elbow-joints and wrists, and makes good hands impossible.

The recruit should be instructed to keep the knee firm to the saddle when the lower part of the leg is used.

4. In the *third period* more advanced instruction in horsemanship is given. This should commence when the pupil has attained to suppleness of the body and the limbs, and consists in combining the play of both so that the rider may learn to move in unison with his horse.

Exaggerated movement of any sort must be discouraged, and the necessity of quietness and of sitting still emphasized. The best horsemen attain their ends with the minimum of exertion to themselves and to their horses.

5. After the first few lessons the recruit's horse should be constantly changed, and he should not be passed in riding until the average animal goes pleasantly with him at any pace.

Concurrently with his instruction in riding the recruit should be taught the principles of saddling and biting, also the points of the horse and other elementary but useful knowledge connected with horses and stables.

6. By following out the methods described an average man, with careful individual instruction, should be able to ride at a trot, and canter over small jumps without reins after about 30 continuous lessons. He should be fit for dismissal in about 60 lessons.

26. *Hints to instructors.*

1. The first necessity is that the instructors themselves should be practical horsemen.

2. Recruits should be carefully taught from the first how to put on and fit their saddles and bridles. The ill-effects resulting from bad fitting saddlery should be explained to them.

Examples of horses badly saddled and bridled should be shown to the men, and they should be made to point out what is wrong, and how the mistake should be put right, *e.g.*, if the front tab of the V-shaped girth attachment is not buckled tightly up, the saddle will slip forward. They should also be taught clearly how the bit acts on the bars of the mouth, and how it should be fitted.

3. Instructors should be mounted, and in addition to a short verbal description, should give a practical illustration of what they require. A recruit who has great difficulty in learning his work by mere verbal instruction may quickly do so by copying an expert horseman.

4. A feature of all instructional work should be its quietness; instructors should never shout and must always keep their temper. They must endeavour from the first to create a

spirit of emulation amongst their pupils, and avoid keeping the more forward amongst them back for the sake of the others.

5. Instructors should make their lessons progressive, and as interesting as possible. In order to give recruits confidence they may be allowed occasionally to amuse themselves in the riding school with their horses, by doing anything they like provided that it is sensible and that the horses are not ill-treated.

When men are working in the open they should be encouraged to ride about independently, so as to get into the habit of making their horses go where they like and do what they wish. As the men improve, instructors should accustom them to riding under as varied conditions as possible.

6. The first portion of the early training can be pushed on much more quickly in a riding school than in the open. The horses are under better control, the nervousness natural to beginners and usually felt by recruits is greatly lessened, for they know that the horse cannot run away, and there is nothing to distract the attention of men or horses. The more advanced training must, however, always be carried out in the open, so as to develop the intelligence of the recruit and give him confidence.

7. The first object of the instructor is to give his pupils confidence, and to teach them balance, the knee and thigh grip, and to sit well down in the saddle. The lungeing whip should not be allowed inside the school, it does more harm than good, frightens the other horses and upsets the men; if necessary, the recruit should be allowed to carry a stick or whip. The first lessons should be short, and no riding school lesson should exceed one hour.

8. Falls should be avoided: they tend to spoil the beginner's nerve and retard his progress. To avoid falls the recruit's stirrups should be connected in the initial stages by a strap passing under the horse's belly, of such a length that the man's

knees are not drawn away from the saddle. The strap prevents the rider's leg from flying out far in any direction, and the confidence it engenders enables him to acquire balance quickly. It should not be used when jumping obstacles over two feet high.

9. More horses are spoilt from being "jerked" in the mouth than from any other cause; particularly when jumping; hence the immense importance of teaching the men from the first to leave their horses' heads alone except for the purpose of control and for applying particular aids.

Men should be taught, therefore, to ride with their reins long.

10. Instructors should be careful not to make their horses rein back, passage, or bend for more than a few minutes at a time. Generally speaking, half the length of the school is sufficient at a time for one of these exercises.

11. In order to teach a man to have a strong seat, with the knee firmly in the saddle, and at the same time to keep his feet pressed down home in the stirrups with the leathers practically taut, he should be practised frequently in standing up in his stirrups. This should be done at first, with the horse standing still, the man resting his hand on the horse's neck if necessary, to assist his balance. Afterwards at the walk, trot, and canter.

27. *Preliminary instruction.*

1. Before a recruit is allowed to mount a horse he should receive instruction on a dummy horse with a view to:—

i. Strengthening his riding muscles.

ii. Giving him the correct seat.

iii. Giving him balance and confidence in his seat.

iv. Accustoming him to keep the knee constantly pressed against the horse's side.

He may also be instructed in mounting and holding the reins. All instruction on the dummy horse should be given under the direction of a riding instructor.

2. The following are good exercises :—

- i. Swinging the lower part of the leg with a circular motion to the rear and towards the horse's side.
- ii. Rising from the knee with stirrups.
- iii. Rising from the knee without stirrups.
- iv. Touching the foot with the hand on each side, with and without stirrups, in each case without moving either leg.
- v. Leaning forwards and backwards in the saddle, with and without stirrups.

3. Before commencing the pupil must be placed well down in the saddle, and must be taught to keep his knees firm to the flap and not to cling with the lower part of the leg.

4. These exercises on the dummy horse may be usefully employed during subsequent training, but should not immediately precede or follow a riding lesson. Exercising tired muscles is not only useless, but harmful.

28. *First lessons to the recruit.*

1. Squads should not exceed 12 in number, and should parade in line, leading their horses.

“STAND TO YOUR HORSES.”—The man stands at attention on the near side of the horse, toes in line with the horse's fore feet; the reins, taken over the horse's head, are held with the right hand near the ring of the bit, little finger between the reins, back of the hand up; the right arm bent, the hand as high as the shoulder; the end of the reins in the left hand, which hangs down by his side without constraint. This is the position of attention when the man is leading his horse.

When the horse is about to be ridden, the position of attention will be the same as above, except that the reins will not be taken over the horse's head and will be held by the right hand only near the bit.

"STAND AT EASE."—The right hand slides down the reins to the full extent of the arm, the end of the reins being retained in the left hand, The position of the man's legs and feet are the same as at foot drill.

If the reins have not been taken over the horse's head, they will be held in the right hand only, the left arm hanging by the man's side without constraint.

"IN FRONT OF YOUR HORSES."—Each man being at attention will take a full pace forward with the right foot, turn to the right-about, and take one rein in each hand near the rings, still holding the end of them in the left hand; hands and elbows to be as high as the shoulders.

This is the position in which a man should stand when showing a horse at the halt.

"STAND TO YOUR HORSES."—Each man will take a full step forward with the right foot to the horse's near side, and turn left-about.

"QUICK MARCH."—Each man will move off holding the reins as above.

"SINGLE FILES RIGHT (or LEFT)" "QUICK MARCH."—Each man will move off in succession, one horse-length from the file in front of him.

2. When leading through a narrow gate or doorway, the man should move slowly, taking care that the horse's hips clear the posts of the door. He should walk backwards holding the head collar with both hands, one on either side of the horse's head. The latter should be sufficiently free for the horse to see where he is going.

In passing an officer the soldier when leading a horse will look towards the officer.

3. *How to pick up a horse's foot.*—The recruit should be taught that in picking up a horse's foot he should face the rear and run the hand lightly down the leg from the shoulder

or quarter along the back of the knee or hock downwards before attempting to lift the foot from the ground.

4. *How to run a horse in hand.*—The reins should be held as described above in "Stand to your horses" and the horse led off. As soon as he breaks into a steady trot the man should release the reins with the hand nearest the horse, and only hold the end of the reins in his outer hand. In turning a horse when in hand, the man should always move round the horse and not swing the horse round himself. In leading a horse past an officer for inspection, the man should place himself on the side nearest the officer.

29. *Mounting and dismounting.*

1. *Without stirrups.*—The reins having been put over the horse's head, and hanging evenly on his neck, the command will be given:—

"PREPARE TO MOUNT."—On this caution each man will turn to the right and close 6 inches to the right.

Holding the reins in his left hand, little finger separating them, he will place the left hand on the front of the saddle. Though the reins should be short enough to check any forward movement of the horse if necessary, they should be of such a length that the horse's mouth is not interfered with by the man when mounting. The right hand will grip the back of the saddle.

"MOUNT."—The man will spring up, assisting himself by straightening his arms, pass his right leg over the horse and lower himself into his seat. When mounting without a saddle the left hand will be placed in front of the horse's withers, and the right arm on the horse's loins, fore-arm well to the off-side, fingers closed.

"PREPARE TO DISMOUNT."—Each man will place both his hands on the front of the saddle, and raise himself from the horse's back by straightening his arms. When

dismounting without saddles, both hands will be placed on the horse's withers.

"DISMOUNT."—He will vault lightly to the ground and assume the position of "*Stand to your horses.*"

Mounting and dismounting should also be practised on the off-side.

2. *With stirrups.*—"PREPARE TO MOUNT."—Turn to the right about. Take the reins in the left hand properly separated as for riding, and with a light and equal feeling on the horse's mouth. Place the left hand on the horse's withers, grasping the mane or the front of the saddle if he has no mane. Place the left foot in the stirrup, and the right hand on the back of the saddle.

"MOUNT."—Spring quietly into the saddle, place the right foot in the stirrup without looking down, and assume the position of attention.

Mounting on the off-side will be taught in the same manner.

"PREPARE TO DISMOUNT."—Shorten the reins and grasp the mane with the left hand, place the right hand on the front part of the saddle, and take the right foot out of the stirrup.

"DISMOUNT."—Carry the right leg over and lower the body gently to the ground: place the left foot in line with the horse's fore feet, turn to the left and come to the position of "*Stand to your horses.*"

3. Whenever the men are dismounted, and have been allowed to *Stand easy* from the position of *Stand at ease*, they will be recalled to attention by the command "STAND TO YOUR HORSES."

4. For instructional purposes the order for mounting and dismounting is given by two words of command, *e.g.* :—

"PREPARE TO MOUNT."—"MOUNT"; "PREPARE TO DISMOUNT."—"DIS-MOUNT," but for trained men there is only one word of command in each case, *i.e.*, "MOUNT" or "DIS-MOUNT."

30. *The seat.*

1. The recruit must be made to sit evenly on his seat well down in the saddle, and not on his fork ; the flat of the thigh and the inside of the knee pressed against the horse, but not so tightly that the man rides on his thighs, as the weight of the body should rest on the seat. Below the knee the leg should hang free. In the earlier stages much attention need not be paid to the position of the body, though from the first the recruit should be taught to get his seat well under him.

2. Great care should be taken to fit the stirrups to the right length to suit the build of the rider. The man should be made to place himself in the saddle with his knees at the most suitable height. The stirrups should then be adjusted so that the bars are in line with the soles of his boots. If a man standing in his stirrups can just clear the pommel with his fork the stirrups are about the right length.

A man with a short thick leg, however, requires his stirrups shorter in proportion than a man of equal height but with a flat thigh and thin leg. The stirrups are intended to be an aid and convenience to the rider, and if they are too long he will lose his seat by leaning forward in his endeavour to retain them ; if too short, the seat becomes cramp and the rider prevented from using the lower part of the leg correctly.

In ceremonial work the stirrups should be kept on the ball of the foot, but at other times the feet may be pushed right home.

31. *How to hold the reins.*

1. The recruit should next be taught how to hold the reins as described below. In the early stage he should only be allowed a snaffle or single rein attached to the cheek of the universal bit, and no curb, and should ride with the reins in both hands. The instructor should impress upon him the

importance of not hanging on by the reins and explain that if he does so he will not make progress and by injuring his horse's mouth will make it difficult to ride.

2. The hands should be low and close in front of the body, thumbs uppermost and knuckles to the front, wrists rounded, and play allowed to the movements of the horse from the wrist, elbows, and when necessary the shoulders. The elbows should be kept close to the body.

3. *Reins in left hand.*—

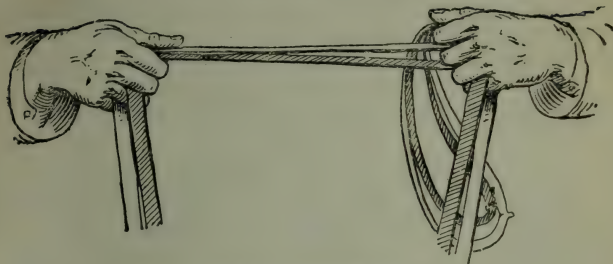
i. *Bridoon or cheek reins only.*—Take the two reins in the left hand, the right rein between first and second fingers, the left rein outside the fourth finger, slack passed across the palm and secured between the thumb and first finger.

ii. *All four reins.*—Place the right bit rein between the second and third fingers, and the left bit rein between the third and fourth fingers. The right bridoon rein between the first and second fingers, and the left bridoon rein outside the fourth finger, the slack of all four reins thrown back over the first finger and secured by the thumb.

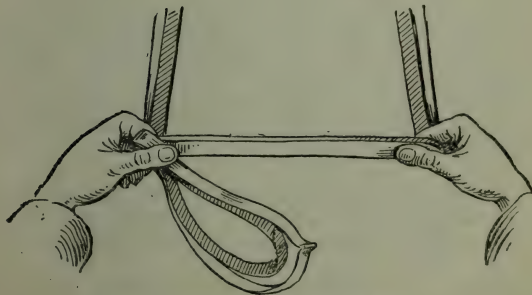
At riding drill drivers when holding the reins in the left hand should place the right hand on the thigh, as described in Section 46.

4. *Reins in both hands.*—In the first place, whether using single or double reins, take them in the left hand as described above; then take up the right rein or reins in the right hand by placing it in front of the left, and pull sufficient of the slack forward through the left hand to obtain an even bearing on the mouth with both hands when held low, just in front of the body and close to the horse's withers.

FIG. 1.

Bit reins shown shaded.

VIEWED FROM FRONT.



VIEWED FROM ABOVE.

In the case of single reins only, the right reins should be held between the third and fourth fingers; with double reins, the two right reins should be separated by the third finger. In each case the right hand should hold only the right rein or reins, the slack of these being secured between the right thumb and forefinger and passing thence into the left hand which will hold both the left and right reins. (*See Fig. 1.*)

5. *To lengthen the reins.*—Allow sufficient rein to slip gently through the fingers.

To shorten the reins.—Keep the reins in the left hand but drop the slack from between the thumb and the forefinger, and take hold of this in the right hand behind the left, slide the left hand forwards until the desired length is obtained. Then as before secure the slack, and, if riding with both hands on the reins, take up the right rein or reins again in the right hand.

6. The recruit should be well grounded in the proper manner of holding the reins, and frequently practised in changing them from one hand to both quickly and *vice versâ* also in shortening and lengthening them at all paces. The importance of keeping the reins supple and unpolished should be impressed on him.

7. Normally the reins should be held in the left hand only, bit reins inside, except in the case of beginners, and when riding young or awkward horses, when both hands should often be used.

Occasionally the left hand may be required to be free, *i.e.*, when leading another horse, in which case the reins of the ridden horse can be held in the right hand.

FIG 2.



32. *Position when at attention.*

1. *Position in the saddle at attention.*—The head and body should be erect and square to the front; upper arm hanging perpendicular; forearm nearly horizontal; thighs flat on the saddle; the leg from the knee down nearly verticle; knees turned inwards and toes pointing towards the front; feet practically horizontal and pressed down into the stirrups.

The correct position of the rider, horse, and saddle is shown in Fig. 2.

2. On the command "*sit at ease*" the reins should be relaxed by dropping the left hand on the front of the saddle. The right hand should rest on the left, back up.

33. *First movements on horseback.*

1. The recruit should then be shown how to start his horse off at a walk from the halt, *i.e.*, he should be made to ease the reins slightly, though still keeping a light feel on the horse's mouth, and press him forward with the legs from knees downwards. He should be prevented from kicking his horse in the ribs with his heels and from sticking his hands forward to slacken the reins. At the same time he should be taught how to halt without jerking his horse's mouth.

The trot should be slow and for short periods and there should be no cantering for the first few lessons.

2. *How to rise in the stirrups.*—The loins must be perfectly lisson, so that the seat may be easy and comfortable; the back should not be hollowed, but the upper part of the body should be inclined a little forward.

The recruit should not try, by rising, to follow or to anticipate the movements of the horse, but should let himself be raised.

His knees (and ankle-joints if riding with the stirrup on the ball of the foot) will sustain his movement and will allow him to descend softly into the saddle. It is advisable to let the recruit commence this at a walk.

3. At the trot without stirrups the recruit should allow his body to be thrown up at each step, and fall on his seat.

In cantering, the knees, the inside of the thighs, and the seat itself, must remain close to the horse, the whole of the body pliant, and accompanying the movement of the horse, so that with each stride the rider feels a forward thrust through his seat from the horse's back.

4. A few turns and circles may now be introduced in the instruction, and in executing them the recruit should be told how to use the weight of his body. He should be instructed, whilst preserving the grip of his knees and thighs, to incline his weight from the hips slightly backwards and to the side to which he is turning.

5. As soon as he has gained some confidence the recruit should ride without reins; he should then be taught to jump first of all over small obstacles, such as the bar lying on the ground. (*See Sec. 34.*)

The recruit should not be allowed to cling with the back of the calf, and it should be explained to him that the use of the lower part of the leg will be taught to him later, and that its employment at this stage will retard his progress.

6. Much of the early training should be without reins, the arms being folded in front of the body, never behind, as the latter tends to throw the upper part of the body forward.

7. Practice in crossing a big V-shaped ditch, about 18 feet wide and 10 feet deep, *i.e.*, large enough to compel their horses to go down one side and up the other is a valuable exercise, as no horse will face the opposite bank unless his head is left alone.

34. *Teaching the recruit how to ride his horse over a fence.*

1. Jumping, when carried out with discretion, both as to the amount of practice given and the state of the ground, is an excellent training for men and horses. Constant practice throughout the recruit's training will enable the man to acquire, and afterwards to maintain, a firm seat, whilst, at the same time the muscles of the horse's back and thighs are developed and strengthened.

It is recommended that the recruit should be taught to jump without reins before being required to do so with them. By this means the men learn to rely on balance and grip and become independent of the reins to retain their seats. In the earlier instruction the recruits should be required to negotiate only the smallest obstacles.

2. Riding over the bar laid on the ground makes a good commencement, the men trotting round the school with suitable distances between horses and jumping it in turns. This has the advantage of leading both man and horse to think that they are doing nothing out of the common, and results in an orderly and quiet procedure.

The recruit should at first be allowed to hold the end of the rein in the flat of the hand to give him confidence, but should be encouraged as soon as possible to drop the reins altogether. The arms should be folded across the chest. Stirrups should be allowed until the instructor considers it advisable for the beginner to jump without them.

3. As the horse takes off, the pupil should be instructed to lean a little forward and to tighten his leg and thigh grip; if he is successful in this his body will soon swing in harmony with the horse. The movements of the body from the hips upwards when riding over a jump vary so much with different horses and different fences, that it is impossible to lay down any hard and fast rule. It is a matter of the combination of balance and leg grip. The horse should be eased up gently

after a jump; on no account should his pace be checked suddenly.

When the initial stage is passed frequent change of horses accelerates progress.

4. The pupil should be gradually trained to handle the reins when jumping, and the greatest care must be exercised to avoid ill-treatment of the horse's mouth during the process. If the shoulder-joints are given free play when the horse requires more rein all jerky movements of the arms and wrists will be avoided as the hands go forward. Reins must be held long, and the man taught to keep his hands low and allow them to come freely forward as the horse is on the downward plane. When riding with the reins in one hand the left shoulder can be brought forward as the horse is descending.

5. Jumping low obstacles is very little exertion to the horse, and the more the recruit has of it the sooner he will be ready to enter the third period of instruction. Before he enters this stage he should sit his horse with ease, both with and without reins, and when jumping, should be able to keep a like feeling on the horse's mouth without in any way interfering with it.

6. The pupil should then be given horses that require "riding" at their fences, and be taught to handle them with resolution. A combination of the qualities of determination and patience are invaluable in a horseman, and should be developed and encouraged at this stage of the training.

35. *Paying compliments mounted without arms.*

When riding with both hands on the reins a soldier passing an officer turns his head and eyes in the direction of the officer without moving his hands. When holding the reins in one hand only he should drop the right hand to the full extent of the arm behind the right thigh, fingers half closed, back of the hand to the right, and turn his head in the direction of the officer.

36. *The Aids.*

1. *General principles.*—The aids are the signals used by the rider to assist him in directing his horse. These signals are made by means of the reins, legs, spurs, shifting the weight of the body, whip, and voice. For instance, the reins can be used to bend the neck, to raise, lower, or turn the head to one side; and to make the horse decrease his speed, halt, or rein back.

The necessity of impressing on all recruits the importance of preserving the sensitiveness of the horse's mouth cannot be over-rated.

The pressure of both legs is an indication to the horse to go forward, and should normally be applied just behind the girth; the leg should only be drawn back when the horse fails to respond to ordinary pressure. The pressure of the leg drawn back on one side is employed to make the hind quarters turn towards the opposite side, or to prevent them from turning towards the side on which the pressure is applied.

When it is necessary to use the spur it should be applied as described in Sec. 38. If when the horse is on the move the weight of the body is shifted, say, to the right, the horse will be inclined to put out a foot on that side, in order to equalize the distribution of weight on its limbs. The hind quarters and forehand are respectively lightened by the rider's body being brought forward and back, or by lowering or raising the horse's head. The movement of the body as an "aid" should be slight, except in the case of a man riding a heavy horse, when more movement may often be necessary, but it should not lead to interference with the horse's mouth.

The indications of the whip are closely akin to those of the leg and spur.

2. "*Walk*" or "*Trot*."—Without drawing the legs back, close them both to the horse according to his temperament, and slightly ease both reins, without pushing the hands forward.

As soon as the horse advances at the desired pace relax the pressure of the legs and feel the reins again as before.

3. "*Halt.*"—Close both legs, and feel both reins, at the same time bring the weight of the body slightly back. As soon as the horse halts relax the pressure of the legs.

4. "*Right turn on the haunches.*"—Close both legs to the horse, using more pressure with the left leg drawn back to prevent his haunches from flying out to the left. At the same time feel the right side of the horse's mouth, press the left rein against his neck, and lean the body slightly to the right.

"*Left turn on the haunches.*"—Reverse the above.

5. "*Right about turn on the haunches.*"*—The same as "right turn," except that the rider should lean his body slightly back as well as to the right and as required apply more continued pressure on the right rein and firmer pressure with the drawn back left leg to compel the horse to turn on his haunches.

6. *To collect the horse.*—Make the horse bring his hind-quarters well under him by a pressure of both legs, and induce him to flex his jaw and bring his nose slightly in by a light feeling of the bit rein. The pressure of the legs should precede any feeling of the reins. In this way the rider causes the horse to stand, walk, trot or canter, at attention.

7. On the command "*Rein back,*"—the rider will collect his horse, then feel the horse's mouth as an indication for him to step backwards; the rider must never have a dead pull on the horse's mouth, but when the horse has taken a step back, should ease the reins and then feel them again. The horse should always be kept up to his bit by a pressure of both legs.

The trained horse should rein back collectedly, with head carried fairly high, and the body balanced equally on all four legs. He must be made to move in a straight line, and must

NOTE.—Horses should never be turned except on their haunches.

not be allowed to run back out of hand, but must make each movement in obedience to the properly applied indication of the rider. Nor should he be allowed to halt in an uncollected position.

8. *To canter off fore and off hind leading.*—Collect the horse, and by a strong pressure of the drawn back left leg make him strike off into a canter. Prevent him from turning his quarters to the right by a supporting pressure of the right leg as required. When cantering the horse's body and neck should be in a straight line, his head and neck should be kept straight in the direction in which he is moving and should not remain bent away from the leading leg, though it may be necessary to turn them slightly away at the start. The horse must be made to canter true and united.

To canter near fore and near hind leading.—Reverse the above aids.

Methods of telling if a horse is cantering true :—

- i. Look at his shoulders and fore feet : the shoulder and foot of the leading leg should be the most advanced.
- ii. Look at his hind legs. The leading one of these should be on the same side as the leading fore leg. The horse's croup will be slightly turned towards the side of the leading legs.

If the horse is disunited, the movement felt in the seat will be a jolting and twisting motion.

9. *To change from off fore and off hind to near fore and near hind at the canter.*—Close both legs to the horse and turn his head slightly to the right ; prevent him from turning his body to the right by the pressure of the left leg, put the weight of the body slightly backwards and cause him to change by a stronger pressure of the drawn back right leg.

To change from near fore and near hind to off fore and off hind, at the canter.—Reverse the above aids.

10. "*Circle right at canter*" (from the halt, walk, or trot).—Apply the aids described for the "*Canter, off fore and off hind leading,*" and guide the horse round to the right.

"*Circle left at the canter.*"—Apply the aids described for the "*Canter, near fore and near hind leading,*" and guide the horse round to the left.

37. *Bending.*

1. Bending affords the advanced recruit a lesson in applying the "aids." It is a tiring exercise for the horse and should be practised with discretion.

In all bending work it is important that the horse should yield his jaw slightly, as this conduces to lightness of hand.

His neck should be kept straight from the withers onwards to near the poll, his head itself being turned in the direction in which he is moving.

Bending, as a rule, should be done on the move.

2. *To bend a horse:—*

- i. *On the snaffle.*—If to the right, the rider should bend the horse by a gentle pressure on the right rein, at the same time giving to him slightly with the left rein but still retaining a gentle feeling on the left side of his mouth, and using the pressure of the legs as required; as soon as the horse bends to the hands cease bending and make much of him.
- ii. *On the bit.*—The left hand, holding the reins, should have an equal feeling on all four reins. In bending to the right, place the third finger of the right hand between the two right reins and slightly feel the horse's mouth, using the pressure of the legs as required; when the horse yields to the feeling by relaxing his jaw and bending as required the hand should immediately yield to him.

The outer rein in bending should always retain a steady feeling to support the inner and to ensure the bend being made just in front of the poll.

3. *Bending Lesson*.—With beginners it is advisable that bending should take place in the riding school or manège, but, as the instruction progresses, it should be practised outside.

The following movements should be practised (*see Fig. 3*):—

Right shoulder in.

Left shoulder in.

Right pass

Left pass

} To move across the school or to a flank.

In the “*shoulder in*” the horse’s body should be inclined at about a half turn to the direction in which he is to move.

In “*right*” or “*left pass*” the horse’s body should be kept approximately square to the direction in which he is moving, being inclined only just sufficiently in that direction to enable him to cross his legs.

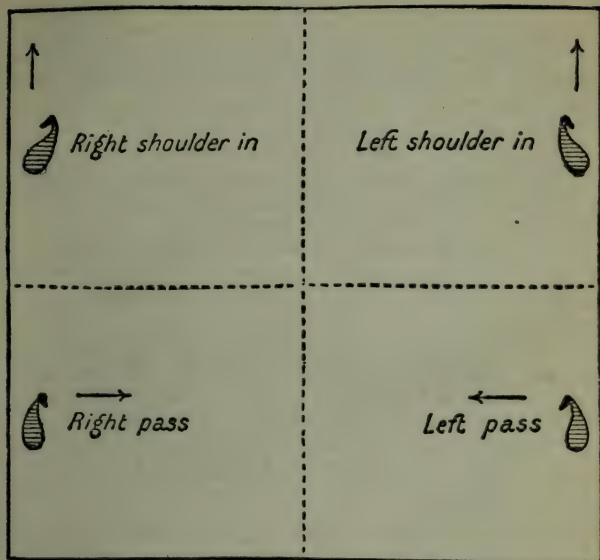
These movements should all be made in the same way. Thus in “*right shoulder in*,” the left rein bends and leads the horse assisted by the right rein. The pressure of the rider’s right leg makes the horse cross his legs (except in the case of the half passage) whilst the rider’s left leg keeps him up to the hand and prevents him from swerving.

Horses should not be turned at the corners when in the position of “*shoulder in*.” On reaching a corner each horse should be walked on and made to “*shoulder in*” after passing it.

To turn to the right when passaging to the right: Stay the hind quarters with the right leg, lead the forehand round with the right rein, keep the left leg closed to prevent the quarters from flying out.

In working the shoulder in and passages, fore and hind feet should move on four distinct lines parallel to each other.

FIG. 3.



38. Spurs.

1. When the recruit has learned to preserve his proper seat and balance, and has a knowledge of the aids made with the hands and legs, he may ride with spurs. In making use of them he must not open his thighs or move his body forward; the leg from the knee downwards only should move. Spurs with sharp rowels should only be allowed in exceptional circumstances.

2. The spurs should be used as little as possible, but when they are necessary the horse should be made to feel them. A continual light touch with the spurs will either make the horse kick or cause him to become insensible to them; a jogging motion of the leg, with the heel drawn up, should therefore never be allowed.

39. *Various exercises.*

1. *General principles.*—The recruit's course should proceed by degrees according to the progress made, and any or all of the following exercises may be found useful.

Others which suggest themselves to the instructor may be added. Each exercise or game, however, should have a sensible object in view, and should be looked on merely as a means to an end.

2. *The circle.*—The ride being told off by fours, "Nos. 1 CIRCLE RIGHT (or LEFT)," each No. 1 will ride his horse in a circle and fall-in in the rear of his section of fours, Nos. 2, 3, and 4 doing the same when ordered by the instructor.

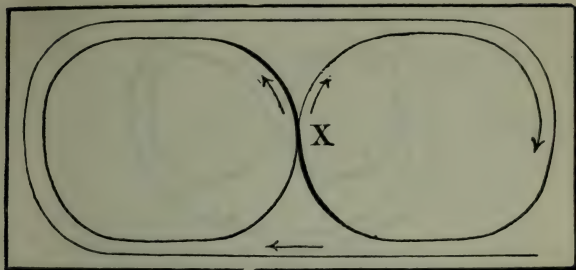
"ODD (or EVEN) NUMBERS CIRCLE RIGHT (or LEFT)."—Each odd (or even) number will ride in a small circle and fall-in behind the even (or odd) number immediately behind him.

"HEADS OF FOURS CIRCLE RIGHT (or LEFT)."—The leading man of each section will ride in a circle followed by 2, 3, 4. They will continue in the circle until they get the command "GO LARGE," when they will cease circling and resume their original formation; or the rein may be changed by the word of command "HEADS OF FOURS—CHANGE."

3. *Figure of 8.*—For preliminary training in this movement the horse should be cantered quietly on a large circle or an oblong of about the same length as the school.

i. *In the riding school or manège.*

FIG. 4.

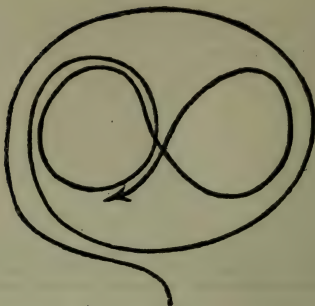


The change of rein and leading legs should be made as soon as the new circle is commenced at X. (See Fig. 4.)

ii. *Outside.*—First start off at a canter on a moderate sized circle on either rein. As soon as the horse is moving correctly and collectedly, turn inwards and describe a small circle still on the same rein, but about half the size of the first, when this is completed change the bend of the horse and the leading legs, and make a similar circle on the other rein, the two circles describing the figure of 8 within the original circle. (See Fig. 5.)

In changing the bend, jerking the horse's head across from one side to the other should not be allowed; to compel the leading legs to be changed it is necessary to turn the horse's head slightly outwards, the rider at the same time should incline his weight to the side to which he wishes the horse to change, and press with his outer leg, these movements should be made gently, and as soon as the horse has changed the leading legs, both fore and hind, his neck and head should be turned to look the way he is going.

FIG. 5.



40. *Leading horses.*

1. When riding one horse and leading another, the led horse should be on the near side, so that when meeting or being overtaken by traffic the man, by keeping on the left of the road, will have the ridden horse between the led horse and the traffic.

If the led horse is fresh, the bridoon rein should be taken through the near ring of his bridoon and held short, about 1 foot from his head: the end of this rein should be kept in the left hand, crossing the reins of the ride horse. If the led horse tries to break away, the man should circle the two horses to the left.

2. When leading two horses one should be on each side.

3. When leading three horses one should be on the near side and two on the off side. When leading two horses on the same side the reins of the outer horse should be passed between the jaw and the jowl piece of the head collar of the inner horse before being gathered up.

41. *Methods of securing horses.*

1. *Tying up a horse.*—In securing the horse by the reins or head rope to a tree, bush, or fence he should be tied in such a way that he cannot injure himself (wire fences or spiked iron railings should obviously not be used) or break his reins by treading on them.

The knot used should be capable of being quickly tied and untied and should not come unfastened if the horse becomes restive.

The following is a useful method for securing a horse to a bush or small tree. (See Fig. 6.)

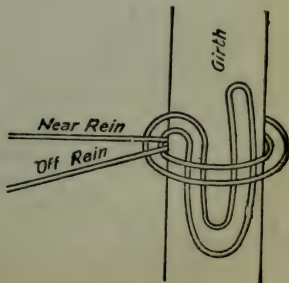
Take a suitable branch or bunch of branches, place the loop of the reins under and round it, then double back the end of the branch, breaking it if necessary and passing it through the reins as shown below and tighten up. A separate piece of stick will answer the same purpose.

The more the horse pulls the tighter will the knot become.

FIG. 6.



FIG. 7.



2. Single horses can also be kept from straying as follows:—

- i. By knee-haltering. One end of the rope is made fast above the knee by a clove hitch, fairly tight, with a keeper knot (half-hitch) round the rope to prevent it from becoming loose. The other end is then carried back to the head collar and so secured that the horse cannot tread on it. The rope should be from 1 foot to 1 foot 6 inches from the knee to the lower ring of jowl piece of the head-collar.
- ii. By securing the bit to the stirrup iron by means of the rein or strap.
- iii. By securing the bridoon rein to the girth on the near side; this is done by taking the bridoon reins over in the usual way and passing them under the girth from front to rear. They should then be drawn sufficiently tight to bend the horse's head to the left and fastened by a single hitch, but without drawing the slip end through. (See Fig. 7.) When mounting in haste the rider can easily loosen the slip knot after mounting, and then pull the reins clear and pass them over the horse's head.

3. *Coupling horses.*—Horses can be securely coupled by turning them head to tail and tying each with the bridoon rein to the off back-strap or arch of the saddle of the other, taking care that the reins, when tied, are not more than 6 to 8 inches long.

FIG. 8.



With three horses one can be tied to the head collar of either of the two horses so coupled. Four horses are secured by tying a horse to each of the two originally coupled. No horse should have more than 1 foot length of rein, and the best knot to be used is a slip knot round the rein itself.

4. *Linking horses.*—The head ropes are brought over the horses' heads clear of the reins, without unfastening the coil or knot. Each man, facing his horse, hands his rope to the man on his right, who passes it through the upper ring of his own horse's head collar and ties it with two half-hitches.

42. *Riding with the sword. (Drill.)*

1. To "*Draw Swords.*"—"DRAW-SWORDS."—i. Pass the right-hand smartly across the body, over the bridle arm, draw out the blade so as to rest the hilt on the bridle arm, place the sword knot on the wrist, give it two turns inward to secure it, and then grasp the handle with the right arm close to the body, shoulders square to the front.
- ii. With an extended arm draw the sword slowly from the scabbard, in the rear of the left shoulder, and bring it smartly to the *Recover*, that is, with the bar of the hilt in line with the bottom of the chin, blade perpendicular, edge to the left, elbow close to the body.
- iii. Lower the sword smartly to the *Carry*, that is, with the hilt resting on the thigh, blade perpendicular, edge to the front, the grasp of the lower fingers slightly relaxed, little finger in rear of the hilt, arm close to the body, that part of it between the wrist and the elbow lightly touching the hip.
2. To "*Slope Swords.*"—"SLOPE-SWORDS."—Bring the lower part of the arm at right angles to the upper, hand in front of the elbow, relax the grasp of the second

and third fingers, and allow the sword to fall lightly on the shoulder, midway between the neck and point of the shoulder, the little finger still in rear of the hilt.

3. To "*Sit at Ease.*"—"SIT AT EASE."—Keeping the sword at the slope, place the hands on the front part of the saddle, with the right hand over the left.

4. To come to position of *Attention.*—"ATTENTION."—Come smartly to the position of *Slope Swords.*

5. To "*Carry Swords.*"—"CARRY SWORDS."—Resume the grasp of the second and third fingers and bring the blade perpendicular, the hilt resting on the thigh, as in the third motion of drawing swords.

6. To "*Return Swords.*"—"RETURN SWORDS."—i. Carry the hilt smartly to the hollow of the left shoulder, blade perpendicular, edge to the left, elbow level with the shoulder; then by a quick turn of the wrist drop the point in rear of the left shoulder slowly into the scabbard, and resume the position at the end of the first motion in *Draw Swords*, shoulders being kept square to the front throughout this motion.

ii. Drop the sword lightly into the scabbard, release the hand from the sword knot by giving it two turns outwards, the right hand remaining across the body in line with the elbow, fingers extended and close together, back of the hand up.

iii. Drop the right hand smartly to the side.

7. When *Draw Swords* is ordered at the walk, the men after drawing will remain at the *Carry* until ordered to *Slope*; but if *Draw Swords* is ordered at the trot or gallop, the men will come to the *Slope* after drawing.

8. *Proving.*—In proving with a drawn sword, the sword is brought to the *Carry*, and again sloped on the command "AS YOU WERE."

9. *Paying Compliments with Drawn Sword.*—An officer or soldier should “*carry*” his sword and turn his head and eyes in the direction in which the compliment is to be paid.

43. *Riding with the rifle (drill)*

1. *To Mount.*—“*PREPARE TO MOUNT.*”—Take hold of the barrel of the rifle with the left hand, about 3 inches below the muzzle, butt downwards, and prepare to mount.
“*MOUNT,*” mount as usual, raise the rifle with the left hand, seize it with the right hand in front of the magazine, and place it in the bucket.
2. *To Dismount.*—“*PREPARE TO DISMOUNT.*”—Seize the rifle with the right hand by the small of the butt.
TWO. Draw the rifle out of the bucket far enough to allow the hand to re-grasp it just in front of the magazine; raise it so as to clear the front of the saddle.
THREE. Lower the butt under the bridle hand, and hold the barrel with the left hand about 3 inches below the muzzle.
FOUR. Place the right hand in front of the saddle, and quit the right stirrup. On the command “*DISMOUNT,*” dismount as usual, bringing the rifle to the position of the “*Order*” in the left hand, and hold the bridle with the right hand.

If required for dismounted service, as soon as the horse is given up, the rifle is passed from the left hand to the right.

3. *The Advance.*—In this position the rifle is held with the right hand in front of the magazine, resting on the upper part of the right thigh, thumb and fingers round the rifle, muzzle pointing to the left front, just clear of the horse’s near ear, trigger guard to the front.

4. *To Draw Arms.*—"DRAW ARMS."—Grasp the rifle at the small of the butt.

"Two."—Draw the rifle out of the bucket far enough to allow the hand to re-grasp it just in front of the magazine.

"THREE."—Retaining the same grasp, bring the rifle to the *Advance*.

5. *To Carry Arms.*—"CARRY ARMS." (From the *Advance*.)—Without moving the right hand from its grasp of the rifle, place the butt on the upper part of the right thigh, the muzzle leaning to the front and in line with the right eye, trigger guard to the left, back of the hand down, arm slightly bent, elbow close to the side.

6. *To Return Arms.*—"RETURN ARMS."—This is done in one motion as follows:—Raise the butt of the rifle and lower the muzzle into the mouth of the bucket, pressing the rifle well home with the right hand, trigger guard to the rear.

DRIVING.

44. *General principles.*

1. All officers and non-commissioned officers of mounted units, and drivers, should possess a thorough knowledge of the principles of driving and of fitting harness.

2. Even and steady draught is a matter of paramount importance; the respective weights behind teams are calculated on the assumption that every horse will do his fair share of work; this is impossible unless the driving is of a high order. If the driving is not good, neither long marches nor efficient transport service can be assured.

3. When draught is even and steady every trace in the team is taut, and the horses' heads are facing straight to the front. If, for example, an off-horse's head is pulled inwards, his

draught power is reduced and he is liable to become collar galled.

4. The lead driver is responsible for direction, distance, and pace; it is the duty of the centre and wheel drivers to keep the traces taut and cover him.

5. Temperament should be the first consideration in teaming horses. A slug should therefore, if possible, not be included in a team of very willing horses.

6. The position of the horses should frequently be changed; a hand horse, for example, loses his back muscles if he is never ridden, and is also apt to acquire the habit of leaning on the off-side of the bit.

45. *Fitting draught harness.*

1. The *saddle, saddle blanket, girth, surcingle, bit, curb chain, head bridle, nose band, throat lash and head rope* will be fitted as for the riding horse. (See Secs. 21-24.)

2. The *riding rein* should be fitted of such a length that the driver has complete control over his horse.

In the *leading rein* the short piece on the near side should be carefully fitted so that the bearing of the bit in the horse's mouth may be even when the rein is held in the driver's hand.*

The *side rein*, if required, should be buckled to the cheek of the bit of the off horse, the end being buckled to the saddle.

3. The *breast collar* should hang horizontally from the padded neck straps, the lower edge about one inch above the point of the shoulder. The higher it is in reason the less chance there is of the horse galling.

4. The *pole bar supporting straps* should be sufficiently short to carry the bar the width of a hand above the sharp breast bone: if lower, the bar will gall the horse's chest. Care must be taken to have the bar horizontal.

* NOTE.—Special reins for near and off horses will eventually be abolished and ordinary riding reins substituted.

5. The *loin straps* should be so fitted that the traces shall be in a straight line when the horse is in draught.

6. The length of the *traces* must depend on the size of the horses. The distance between horses in a team should not be less than one yard from nose to tail, but the traces of each pair of horses must be the same length.

7. The *breeching* should be fitted about 16 inches below the upper part of the dock; it is kept horizontal by the long loin straps. When put back in the breeching the horse should be at least a foot from the footboard.

8. *Pole chains* should be so fitted that when wheel horses are standing up to their collars there is no pull on the chains. By the use of a tug neck piece in connection with the pole bar supporting straps, horses with wheel harness can be harnessed to G.S. wagons whether the latter are fitted with pole chains or pole straps.

46. *Position of a driver standing to his horses and mounted.*

1. The driver stands to his horses on the near side of his riding horse in line with the fore feet, holding the reins of both horses (the leading rein passing over the riding horse's neck) in his right hand, right arm extended and level with his shoulder; left arm hanging down by his side; whip, stock upwards, in his legging.

2. On the command "PREPARE TO MOUNT," the driver turns to his right about, places the leading rein over the riding rein in the palm of his left hand, puts his left foot in the stirrup, and takes hold of the front of the saddle with his left hand and the back of the saddle with his right; if he cannot reach the back of the saddle he must take hold of the flap.

With the universal reins, the riding horse's rein is held in the full of the hand, the end hanging down between the first finger and thumb, little finger dividing the reins. The leading rein is held in the full of the hand, the end hanging down

from the opposite side of the hand to that of the ride horse's reins.

At "MOUNT" he raises himself in the stirrup, passes his right leg over the horse and drops quietly into his saddle. He then adjusts his reins so that he has an even feeling on both horses' mouths, takes the whip out of his legging with his right hand, which he passes through the loop at the end of the stock, and places on his right thigh, back up, grasping stock and thong close together with his elbow a few inches from his body.

This is the position of attention, mounted.

3. On the command "SIT AT EASE," both hands are placed on the pommel of the saddle, the right hand holding stock and thong of whip over the left.

4. On the command "PREPARE TO DISMOUNT" the driver places the whip in his legging.

At "DISMOUNT"—if the driver cannot reach the ground with his right foot while the left is still in the stirrup, he takes both feet out of the stirrups, and the body, at first supported by both hands, is gently lowered to the ground. He then comes to the position of standing to his horses.

5. On the command "STAND AT EASE," keeping both legs straight, he carries the left foot about one foot-length to the left, and slides the right hand (retaining hold of the leading rein) down the riding rein of the riding horse as far as it will go; his left hand hanging down the thigh.

"STAND EASY."—He fastens the leading rein to the riding rein by means of a thumb knot.

47. *The use of the whip.*

1. The whip is chiefly used to control the off horse: *i.e.*, to start him, to keep him in the collar, and to guide him when turning. It should be applied lightly on to the off side of the

neck just in front of the withers, fingers closed on stock and thong.

2. The driver also salutes with his whip when at a walk, in the following manner :—He brings it to the recover as with a sword, passes it over the withers of the off horse, right arm extended, but with the elbow raised and slightly bent, hand in a line with the waist, back of the hand up and inclined to the front, fingers firmly closed on the stock and thong. The driver should hold his body erect with the shoulders square to the front, and look the officer full in the face. When the salute is finished, the whip is brought to the recover and then down to the position of attention. The salute commences four paces from the officer, and finishes four paces beyond him. A driver when halted, or at the trot, salutes by coming to attention and looking the officer full in the face.

3. On rare occasions the whip may be used to punish a horse, when the thong should be applied once on the shoulder. This procedure is seldom justified, and is liable to upset the other horses in the team.

At all other times the thong should be held close against the stock with the end of the lash hanging down.

48. *Instruction in driving without vehicles.*

1. Before recruits are allowed to drive horses in draught they should be practised in manœuvring the team alone. The centre and wheel drivers thus learn in the initial stages to keep the traces taut, and all likelihood of either spoiling or overtiring horses is avoided.

2. The riding school is well suited for this training; three teams can be worked together in an ordinary sized building, and they are more under the instructor's eye than in the open.

3. The positions of the drivers in the team should frequently be changed.

49. Hooking in and unhooking with pole harness.

1. *Hooking in.*—Hooking in should be carried out with complete teams. If possible the team should come up on the left of their carriage, as it is easier for the wheel driver to get his horses into position from the near than from the off side.

2. Hooking in can be carried out either by two sappers or by the centre driver, who dismounts for the purpose. Before commencing to hook in the supporting bar is brought up from the carriage and attached to the neck piece of the wheelers.

By Sappers.—One man holds up the pole near the footboard and the other goes round by the head of the off wheeler and as the wheel driver backs his horses guides the ring of the supporting bar on to the pole. As soon as the ring is on the pole the two men fasten the wheel traces, commencing with the outside trace of each horse. The inside traces of the centre horses must pass over the supporting bar to prevent the pole tipping up.

By Drivers.—The centre driver dismounts, and having secured his leading rein to his driving rein, raises the pole at the point and guides it into the ring on the pole bar. He then fastens the wheel traces as described above.

3. *Unhooking.*—In unhooking, each man unfastens what he fastened when hooking in, commencing where he left off.

By Sappers.—The two sappers unhook the wheel traces, and as soon as the attachments are released, the wheel driver gives the word "DRIVE ON." The team drives on, allowing the pole to fall to the ground.

By Drivers.—The centre driver dismounts and unhooks the wheel traces.

4. In exceptional circumstances the team can be unhooked in the following manner. The wheel driver releases the trace attachments of both wheel horses at the breast-collars, and the team drives on, allowing the pole to fall to the ground. The breechings and traces should be replaced on the horses as soon as possible.

50. *Hooking in and unhooking with shaft horses.*

1. The drivers dismount and stand to their horses. At the word "HOOK IN," the drivers turn to the right, and tie the leading to the riding reins.

2. The lead driver doubles round by the front to the off shaft, the centre driver to the off side of his off horse, the wheel driver stands between his horses' heads, and takes hold of the head stall of the shaft horse with his left hand close to the bit, the right hand on the tug.

3. The lead driver raises the shafts and gives the word "READY"; the wheel driver then backs the shaft horse, both drivers guiding the tugs upon the shafts; then they hook the traces and buckle the breeching.

4. The wheel driver hooks in the near wheeler, and the lead and centre drivers their own horses.

5. Each lead driver, standing in front, takes hold of the bit of each of his horses, stretches the traces, and places the horses square with the carriage; all stand to attention.

6. The traces should always be hooked before the breechings are buckled.

7. In unhooking, each driver undoes what he did in hooking in, but in the reverse order; bearing in mind that a breeching should be undone before a trace.

8. When the drivers remain mounted the sappers hook in and unhook as above described.

9. If a pair only is to be hooked in, and there is no one to assist the driver, he ties his horses together, and, holding his off horse with his right hand, raises the shafts and slips the off tug on; he then passes round and slips on the near tug; he then hooks in the near trace and buckles the breeching, and then hooks in the off trace, and buckles the breeching; he next hooks in the off trace of the near horse and buckles the breeching, and then hooks in the near trace.

11. In unhooking, having tied his horses together as before directed, he unhooks the near trace, then unbuckles the breeching, then the off trace; then the near trace of the off horse, the near side breeching, and lastly the offside breeching and trace. He then, supporting the shafts with one hand, moves the horses forward sufficiently to clear the points of the shafts from the tugs, when he places them gently on the ground and takes hold of his horses.

51. *Moving off.*

1. On the command "MARCH" the drivers ease the reins and close their legs to the riding horse, laying the whip over the neck of the off horse, to ensure both horses starting together. To prevent loss of distance, every man in a team should start his horses on the command "*March.*"

2. In all alterations to a quicker pace the drivers use their legs on their riding horse, and the whip on their off horse as described in Section 47.

52. *Halting.*

1. The lead and centre drivers raise the whip hand as high as the head, the whip horizontal across the front, as a signal to the wheel driver.

All three drivers feel their reins and take their horses out of the collar. The wheel driver, with his right hand on the leading rein, puts his horses back in the breeching.

As soon as the carriage stops, every horse is again put into the collar.

2. At any pace but the walk the lead and centre drivers must allow the wheel driver sufficient time to stop the carriage before they come to the halt.

53. *Wheeling to the right.*

1. The lead driver wheels his riding horse by leaning his body to the right and feeling the right rein; he brings his off

horse round at the same time by feeling the leading rein with his right hand.

The centre and wheel drivers follow the track of the lead driver, laying their whips over their hand horses' necks to keep them from flying out or hanging back.

Note.—On a horse that is not properly trained the lead driver may have to apply his right leg as an additional aid. No application of the left leg is necessary, as the traces prevent the horse's quarters from flying out. (*See Sec. 36.*)

54. *Wheeling to the left.*

1. The lead driver wheels his riding horse by leaning his body to the left and feeling the left rein; he brings his off horse round at the same time by placing the whip over his neck.

The lead driver may have to apply his left leg on an untrained horse (*see note above*).

The centre and wheel drivers follow the track of the lead driver, applying the same aids at the point of wheel.

Riding horses must not be allowed to hang back.

55. *Wheeling about.*

1. In this case the drivers lean their bodies slightly back, and to whichever side they are turning. In going to the right about the wheel driver should take the leading rein in his right hand instead of placing his whip over the neck of the off horse. In wheeling to the left about it may be necessary for him to use both hands on the riding horse to keep him from turning too soon. Otherwise the aids are the same as for wheeling to the right or left, but are continued longer.

2. In order to prevent the carriage from locking, the wheel driver must be very careful to keep up his hand, or riding horse, as the case may be, and the lead driver must on no account make the circle too small.

3. Carriages should be advanced one yard before being wheeled about from the halt.

56. *Driving up steep hills.*

1 To exert his strength to the utmost when pulling up hill, the draught horse must get as much weight as possible forward and into the collar. By assuming a lower and more advanced carriage of the head and neck than he would do if moving balanced and out of draught, he is able to add considerably to his power. He should therefore be allowed full liberty of rein when ascending a steep hill.

2. When on a road or track, and circumstances permit, the unit should be halted at the foot of a steep hill and sent up by sections with about 10 yards' distance between carriages.

On exceptional occasions, such as when a team is done up, an extra pair may be hooked in, but it must be remembered that this is of little use unless the ascent is straight, and that in any case it makes steady draught more difficult.

3. Should a check occur on a hill when the column is closed up the lead drivers in rear must be prepared to throw off their horses to the right or left.

The pace should be a steady walk during the whole ascent, by which the top will be reached more easily and surely than if an attempt is made to "*spring*" the hill.

4. Dismounted men can assist with drag ropes hooked into the drag washers, or by applying "*wheel purchases*," if the carriage actually sticks. To use a drag rope as a "*wheel purchase*" it is hooked round the felloe near the lowest spoke, and is then laid on the tyre and passed over the wheel to the front. Should the wheel slip round, a drag rope may be wound round the felloe and tyre, with the turns about a foot apart to enable it to get a grip.

5. After going up a steep hill, the horses should be halted, but when this cannot be done, they should be allowed to move slowly to recover their wind.

57. Jibbing.

Horses jib from various causes, such as sore shoulders, a too heavy load, bad driving, sore mouth, lameness, and vice. The whip only aggravates the evil. A handful of gravel placed in the horse's mouth often starts a jibber pulling at once, especially if the wheels are manned at the same moment. The latter is important in any case.

58. Driving down hill.

1. In driving down hill, the lead and centre drivers hold their horses back to allow the wheel driver the management of the carriage, but the traces must be kept up; the wheel driver with his right hand on the leading rein keeps his horses steadily in the breeching, taking care not to throw them on their haunches, and, in the case of shaft draught harness, not to let too much work fall on the off horse.

2. For moderately steep descents, the brake can be used. Should a descent be so steep that the brake is not sufficient, dismounted men must hold on with the drag ropes hooked into the drag washers.

59. Applying the brake.

The brake should be put on sufficiently tight to check, but not to skid the wheel. In crossing a valley the man in charge of the brake must begin taking it off soon enough for the wheels to be quite free before the beginning of the rise on the other side is reached, or in fording a river before the carriage gets into the water.

60. Reversing in narrow roads.

Before attempting to reverse, the carriage should be drawn up as close to the side of the road as possible. The carriage is next unlimbered, and the lead and centre horses unhooked and taken out. The body is then reversed, followed by the limber.

61. *Driving a pair of horses from the box.*

1. When driven from the box, horses will neither work comfortably nor be under perfect control, unless so coupled that when on the move with an even bearing on the reins their heads are straight. The bearing of the bits on their mouths should be light, but constant, and the reins should never be allowed to slip through the driver's fingers.

A pair of horses, worked as such, should frequently be interchanged. This will prevent the acquirement of bad habits, such as pulling away from the pole, shouldering the pole, &c.

2. *To put to.*—The horses should be led up alongside the pole by the noseband (not by the bit), the chain should then be passed through the ring of the breast collar or kidney link of the hames. The traces should next be fastened, the outer ones first, and finally the horses should be poled up and coupled together. In unhooking, the above procedure is reversed.

The correct adjustment of the *coupling reins* requires great care. With a view to this, the outer reins have a number of holes punched in them, up and down which the buckles of the coupling reins can be shifted, thus enabling them to be shortened or lengthened to suit each particular horse's mouth. For instance, if the near horse carries his head to the near side, the coupling rein on the off side should be taken up, when his head will be straightened, and *vice versa*.

3. *Sitting on the box.*—The driver should sit square to his front on the box, which should be low enough to allow of his legs being well bent at the knee. If the box seat is too high he is liable to be pulled off when a horse stumbles.

4. *How to hold the reins and whip.*—The near rein passes over the forefinger, the off rein between the middle and third fingers of the left hand, both reins fall through the palm of the hand and hang loose on the left side of the driver's knees. The reins are kept in position in the hand by the pressure of the

third and fourth fingers assisted by the second ; the thumb and forefinger should not be used for this purpose. The wrist should be rounded.

The whip should be held between the lower part of the thumb and the base of the forefinger of the right hand, thus leaving the fingers free. The point of the whip should be carried up, the stick inclined across the body and to the front. The position of the whip should not be changed when the right hand manipulates the reins. When required, the right hand can be placed on the reins in front of the left, first and second fingers on top of the near rein, and the other two between the reins. The former grip the near rein and the latter the off rein.

Reins should always be shortened or lengthened from the front ; *i.e.*, either pushed back through the left hand or pulled out through the left hand.

5. *Use of the whip.*—The whip should be employed as sparingly as possible. When used, the thong should be applied on the shoulder and drawn across from right to left, or *vice versa*.

6. *Turning.*—To turn or incline to the right, the right hand grasps the right rein in the full of the hand, knuckles up and inclined to the front. This gives the firmest hold and at the same time allows of the position of the whip being maintained. To turn to the left, the left rein is grasped in the same manner.

7. *Driving up hill.*—An even and steady walk should be maintained when travelling up a steep hill ; if the load is exceptionally heavy and circumstances permit, the horses should be allowed to incline from one side of the road to the other as the wagon ascends.

8. *Driving down hill.*—The pace cannot be too slow in descending a hill, and the brake should not be applied until the horses take the breeching. When the shoe is used the wheel to which it is applied should be chained to the carriage ; this prevents all chance of accident should the shoe become unshipped when travelling over rough ground.

CARE AND DISPOSAL OF HARNESS AND SADDLERY.

62. *Care of saddlery.*

1. The leather work of all saddlery should be kept soft and supple. The seats and flaps of the saddles and handled parts of the reins should not be polished. It is particularly important to keep leather girths supple with grease.

Minor defects in saddlery should be seen to and put right at once.

2. Stirrup leathers should occasionally be changed from a tall to a short man or be shortened one inch at the buckle ends, to bring the wear on fresh holes.

The girth tabs require special attention and must be renewed from time to time as the holes wear.

All leather work, whether new or old, should be greased before being put away in store, and should be overhauled from time to time, especially in hot or damp climates.

3. All saddlery and harness should be taken to pieces periodically and carefully inspected. Once a year certain parts, such as the inside of breechings, should be dubbed, the leather having first been moistened with a sponge and the dubbin warmed in cold weather; after a few days the dubbin should be rubbed off with a dry brush or rubber.

4. Leather must not be washed with soda or soaked in water; very hot water destroys its vitality at once. Washing in lukewarm water with soap, quickly, and without soaking, will do the least harm if the precaution is taken to apply oil, dubbin, or good saddle soap whilst the leather is still slightly damp. But it is best to avoid washing leather in water as much as possible, and to sponge it only.

63. *Disposal of saddlery and harness in harness rooms or stables.*

1. *Saddlery.*—The *breastpiece* is placed on the saddle peg, the sides hanging straight down.

The *traces* are folded in three equal lengths, secured by the bearing straps, and are hung by the hooks to the Ds on breast-piece.

The *bridle* should be hung up complete, as on the horse's head, the curb hooked over the front of the bit.

The *head rope* is hung up as on the horse.

The *saddle* is placed on the peg cantle outwards, with the surcingle and girth buckled as if on the horse. The stirrups hang at riding length inside the backstay of the head collar.

Nose bags if not in use are kept with the other articles of horse kit.

2. *Harness*.—The *saddles* are hung from the pegs, the blankets being placed over the pegs and under the breast collars.

The *breast collar* is hung on the harness peg by the padded neck strap under the blanket. In the case of lead harness the short traces are hooked to the end link of the chains attached to the tugs and hang straight down. The traces are hung by hooking the Ds on to small pegs on each side of the harness peg.

The *bridle* is hung on the harness peg as if on the horse's head—the reins should hang down from the bit.

The *head rope* is hung up as on the horse.

The *breeching* is hung under the padded neck strap.

The *legging* is hung on the same peg as the inside trace of the riding set, by the top strap, which is buckled; the other straps are left unbuckled ready to put on.

The *whip* is hung by the hand loop on the same peg as the inside trace of the hand set of harness.

64. *Disposal of saddlery and harness in camp.*

1. *Saddlery*.—The *saddle* complete is placed on the ground, resting on the pommel; the stirrup irons are hooked on the points of the side bars.

The *bridle* is placed with the head piece of the bit on the side bars.

The whole is wrapped in the harness wrapper.

2. *Harness*.—*Harness and saddlery* are to be laid down one yard in rear of the line of heel pegs. The *breast collar* is placed on its lower edge in a circle. The *breeching* is coiled round it. The traces are round the breeching. The *saddle* is placed on top, seat uppermost, the bottom of the flaps being turned up inwards—this keeps the breast collar from being crushed when the harness is tied up.

The whole of the head gear is laid across the top of the seat.

The *legging* is placed inside the breast collar under the saddle of the riding set. The *whip* is placed inside the breast collar of the hand set. The whole is wrapped in the harness wrapper.

CHAPTER V.

DRILL.

65. *Preliminary observations.*

1. The object of the drill of an engineer unit is to enable it to take part readily in the movements of any higher organization to which it may belong.

2. The basis of the drill formations of an engineer unit is the normal sub-division of the unit for work in the field : for instance, in a field company the basis is the section, including one double tool cart, one forage cart and one pack horse ; in a field troop the basis is the half troop, including one double tool cart.

3. Vehicles which do not normally belong to such sub-divisions will be formed into a separate or "wagon section," and will be under the direct supervision of the headquarters of the unit.

66. *Signals.*

1. The following signals are to be employed to represent the words of command mentioned :—

<i>Signal.</i>	<i>To Indicate.</i>
i. Arm swung from rear to front below the shoulder, finishing with the hand pointing to the front.	"Advance" or "Forward," or "Commence movement."
ii. Arm circled above the head.	"Retire," or "Right Reverse."
iii. Hand raised in line with the shoulder, elbow bent, and close to the side.	"Walk," or "Quick-time."

Signal.

- iv. Clenched hand moved up and down between thigh and shoulder.
- v. Arm raised at full extent above the head.
- vi. Body or horse turned in the required direction and arm extended in a line with the shoulder.
- vii. Circular movement of extended arm in line with the shoulder in the required direction.
- viii. Arm waived from above the head to a position in line with the shoulder, pointing in the required direction.
- ix. Arm waived horizontally from right to left and back again as though cutting with a sword, finishing with the delivery of a point to the front.
- x. Two or three slight movements of the open hand towards the ground.
- xi. Two or three slight movements with the open hand upwards (palm up).

To Indicate.

- “Trot,” or “Double.”
- “Halt.”
- “Incline.”
- “Wheel.”
- “Sections right (or left) wheel.”
- “Form line.”
-
- “Dismount” or “Lie down.”
- “Mount.”

2. Officers giving signals should, as far as possible, face the same way as those to whom the signals are made, but when a signal ordering a change of direction is made, the body or horse should be turned in the required direction.

All signals should be made with whichever arm will show most clearly what is meant.

In order to ensure uniformity in the system of giving signals, they must be practised in the riding school.

3. Signals of position, such as "*Halt*" or "*Incline*," should be maintained. Signals of movement, such as "*Advance*" or "*Wheel*," should be repeated until it is clear that they are understood.

4. The whistle will be used :—

i. By company and troop commanders to draw attention to a signal about to be made—"a short blast." The whistle must not be used when approaching guns, or infantry already in action.

ii. To turn out troops from bivouac or camp, to fall in or to occupy previously arranged positions—"a succession of alternate long and short blasts."

5. When two or more companies or troops are drilling together, company and troop commanders repeat the whistle of the commander of the whole, and then give their executive command or signal.

Section commanders, as a rule, command by signal.

The leader of every unit is responsible that the command is passed on correctly to the next leader.

WAGON SECTION DRIVING DRILL.

67. *Intervals.*

1. Intervals are the lateral spaces between wagons, men and horses : in the case of wagons they are measured from driver to driver.

2. The following are the normal intervals:—

Close interval between wagons	-	4 yards.
Half " " "	-	10 "
Full " " "	-	20 "
Interval between wagon sections	-	10 "

68. *Distances.*

1. Distance is measured between horses from tail to head, between carriages from rear end to head of following horse or horses.

2. The following are the normal distances:—

In column of route	-	-	-	4 yards.
" " sections	-	-	-	20 "
Close column	-	-	-	10 "

Where two lines of wagons are formed up in one section in two ranks the distance between the ranks is 4 yards.

A horse-length when used as a measure of distance is 8 feet or 3 paces.

69. *General instructions.*

1. The system of drill laid down in the following sections is for four wagons or carts, which are termed a section.

A single wagon or cart is termed a sub-section. Two wagons or carts are termed a half-section. Two or more sections may be drilled together.

2. Whenever it is desired to halt on the completion of any of the movements given in the following sections, the words of command will be preceded by the caution "AT THE HALT."

3. Dismounted men drill as prescribed in "Infantry Training."

70. *Wheeling.*

1. In wheeling a section the pace must be regulated at the pivot, and increased at the outer flank, so that the wheel may

be completed by every sub-section at the same moment. The outer flank must never gallop, the pace of the inner flank being checked when necessary.

2. The estimated amount of wheel forms part of the word of command, viz., "QUARTER LEFT WHEEL," but every wheel is continued until the word "FORWARD" is given (slightly before the completion of the wheel) by the officer or non-commissioned officer who gave the order to wheel.

71. *Dressing.*

1. A section or sub-section should always be halted well in rear of the alignment, and dress forward, the wheel drivers being careful to keep the full length of the traces from the leaders, otherwise correct dressing cannot be attained. The lead drivers are responsible for the interval and dressing of their sub-sections from the flank of direction.

In all formations to the halt at a pace exceeding a walk, the command "WALK" is to precede the word "HALT."

2. In forming line the horses' heads are dressed 6 inches short of the heads of the markers' horses; the section is halted a few yards in rear of the alignment, the section commander gives the word of command—"Nos. 1 AND 4 (FLANK SUB-SECTIONS)—"DRESS UP—HALT"; No. 2—"DRESS UP—HALT"; No. 3—"DRESS UP—HALT".....SECTION—EYES—FRONT"; and similarly if the dressing is from the left. When drilling with more than one section, the section commanders of all but the base section dress their sections from beyond the nearest sub-section of the next section on the flank by which the dressing is being taken up.

In forming column the lead drivers dress on the markers.

In formations to a flank the dressing is by the flank of formation.

3. The commander of each section gives the word "EYES FRONT" when his section is dressed, except in column when the

lead drivers take up their own dressing; the section marker falls in as soon as the section next him (further from the base) has received the word "EYES FRONT." When the formation is complete the officer or non-commissioned officer who has dressed the points gives the word "STEADY" when the base points return to their places by the shortest route and return arms.

Dressing in line is by the section of direction.

72. *Telling off and proving.*

1. A section will be told off as follows:—

"Section—Number." The right lead driver then gives the word "No. 1," the remaining lead drivers numbering in succession.

"Nos. 1 and 2—right half-section."

"Remainder—left half-section."

"Odd numbers—right sub-section."

"Even numbers—left sub-section."

2. Any portion may be ordered to prove (as follows):—At the word "Prove" every driver of the named part raises right hand as high as the shoulder and extends it to the front, pointing his whip (holding the thong in the hand) to the front, keeping it up until the word "Prove" is given to another part of the section, or the word "As you were" is given.

73. *To advance from line.*

Section commander.—"The Section will advance—walk—march."

The section moves straight to its front, lead drivers are responsible for their dressing and interval.

74. *To retire from line.*

1. *From the halt.*

Section commander.—"The section will retire—walk—march."

At the word "MARCH," the right half section advances 10 yards straight to its front, when on a signal from the lead driver of No. 2, both half sections wheel inwards about; the right half section trotting up into line as soon as it has completed its wheel about; the section as soon as it is reformed receiving the word from its commander "FORWARD BY THE LEFT."

2. *On the move.*

Section commander.—"The section will retire."

If "WALKING," the left half section "HALTS," and the movement is carried out as in para. 1.

If "TROTTING," the left half section "WALKS," and after re-forming, the original pace is resumed by the left half section.

75. *To incline.*

Section commander.—"Right (or left) incline."

Each subsection moves at an angle of 45 degrees to its original direction, the dressing being by the flank to which the incline was made as follows:—

- i. At full or half interval, with four horse teams, lead drivers dress on the wheel drivers of the sub-section next to them.
- ii. At close interval with four horse teams, on the heads of the wheel horses next to them.
- iii. At full or half interval with six horse teams, on the centre lead driver of the team next to them. "AT CLOSE INTERVAL" on the heads of the centre lead horses. The section commander places himself on the dressing flank, and to resume the original direction the command "LEFT (OR RIGHT) INCLINE" is given.

76. To diminish intervals.

Section commander.—"Half (or close) interval on the right (or left)."

The sub-section on the flank named moves on at a "WALK," the remainder incline to the right (or left) at the "TROT," each sub-section walking when it has gained its proper position.

77. To increase intervals.

Section commander.—"Full (or half) interval from the right (or left)."

The sub-section on the flank named moves on at a "WALK," the remainder incline to the right (or left) at the "TROT," each sub-section walking when it has gained its proper position.

78. To advance by sub or half sections from a flank.

Section commander.—"Advance by sub (or half) sections from right (or left)."

The named portion moves to the front, the remainder inclining to their places and following on.

79. To move to a flank by sub or half sections.

Section commander.—"Sub (or half) sections, right (or left) wheel."

The named portion wheels in the required direction, the remainder following.

80. To form section from column of sub or half sections.

1. To the front.

Section commander.—"On the right (or left)—form sections."

If the movement is to be at the halt, the leading portion advances 20 yards and halts, the remainder incline into their movement and the rear portion moves up at a trot. Half sections are formed in a similar manner.

2. *To a flank.*

Section commander.—"Section—right (or left) form."

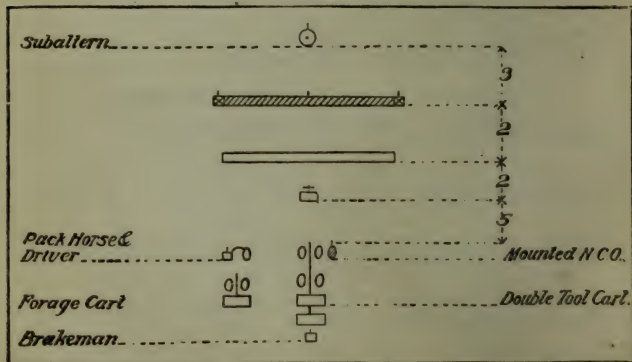
The leading portion changes direction and the movement is completed as in para. 1.

SECTION (OR HALF TROOP) DRILL.

31. *Falling in.*

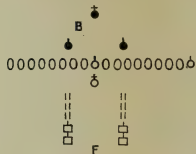
1. The normal formation of a section of a field company, when falling in, is:—Sappers in line (as laid down in "Infantry Training") with carts and pack horses behind at 5 yards distance. The distance is measured from the heels of the supernumerary rank to the heads of the leaders. (See Fig. 9.)









FIG. 9.

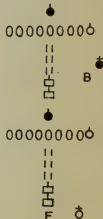
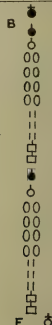


NOTE.—Distances are given in paces.

Plate 1.

FORMATION OF TROOPSTroop in Line

Troop Commander 
 $\frac{1}{2}$ " " 
 Troop Serjeant Major 
 $\frac{1}{2}$ " Serjeant 
 Mounted Sapper 
 Farrier 
 Trumpeter 
 Double Tool Cart 

The Troop in Column of $\frac{1}{2}$ Troops.The Troop in Column of Route

2. The normal formation of the half troop of a field troop when falling in, is:—Mounted sappers in single rank (as laid down in “Cavalry Training”) with double tool cart at 2 horse-lengths distance in rear of the centre of the sappers. (Plate I.)

82. *Inspection and telling off.*

Each section will be inspected by its commander in accordance with “Infantry” or “Cavalry Training.” He will inspect every man, horse and vehicle, observing that each man has the whole of his appointments, that they are in good order and properly put on, that the harness fits correctly, and that the vehicles are properly equipped.

83. *To advance in column of route from the right (or left).*

FIELD COMPANY “Form fours right (or left) left (or right)
SECTION. wheel—Quick march.”

The sappers will move off, followed by the carts in column of sub-sections.

FIELD TROOP The sappers will advance from the named
(HALF TROOP). flank by half sections, followed by the double tool cart.

84. *From column of route to form line on the left (or right).*

FIELD COMPANY “On the left (or right) form section.”
SECTION. The sappers will form section as laid down in “Infantry Training.” The carts will incline to the left (or right) and take up their position in line.

FIELD TROOP The sappers will form half troops as laid
(HALF TROOP). down in “Cavalry Training.” The cart will incline to the left (or right) and take up its position in line.

COMPANY (OR TROOP) DRILL.

85. *General instructions.*

1. Company (or troop) movements are carried out by combining the movements of sections (or half troops).

2. The company (or troop) commander will place himself where he can best exercise supervision.

3. The section (or half troop) commanders will be normally one horse-length in front of the centre of their section, or half troops. In column of route one horse-length in front of the head of their sections or half troops.

4. After inspection their sections (or half troops) the sections (or half troop) commanders will report to the company (or troop) commander, who will instruct them where and in what formation the company (or troop) is to be formed up. He will also issue instructions as to whether dismounted men usually carried on wagons are to be so carried or not.

No men should mount the wagons until the drivers of the horses are mounted.

86. *Formations.*

1. The company (or troop) may form up—

In line. (Plates I and II.)

In column of sections (or half troops).

2. The wagon section, if on parade, will be formed up where the company (or troop) commander directs, and will carry out such movements as may be ordered in similar formations to the remainder of the company (or troop) and in accordance with the principles laid down in Secs. 73-80.

3. The intervals between sections (or half troops) in line will be as the company commander directs.

A FIELD COY
IN COLUMN OF ROUTE


C. C.

☐ Coy. H^d Qrs.
☐ Dismounted.
☐ Coy. H^d Qrs.
☐ Mounted spare
☐ Drivers in fours.


010 Cocks Cart.

00 Spare Horses
2 abreast.

WAGON SECTION

C.Q.M.S.  Section Mounted Sgt.

♂ Captain


 C.O.
 Trumpeter.
 Cyclists.
 2 abreast.
 Section
 in Fours.
 Spare Drivers
 of Section.
 Pack Horse
 and Driver.
 Tool Cart.
 Brakeman on foot.
 Forage Cart.
 Section Officer
 and Mounted N.C.O.

A FIELD COMPANY IN LINE

0.05

Trumpeter X

[illegible]

Sgt

Trestle and G.S. Wagons	2 Pontoon Wagons
----------------------------	---------------------

C.Q.M.S. Caprain

Water and Cook's Carts.	1	1
Brakemen as necessary at rear of their vehicles		

Notes (1) Distances and intervals are given in paces
(2) There are eight cyclists per section.

28173/259. 20.000

W. 82 L. 10. 14-

If the number of sappers in field companies is insufficient to cover the carts, the intervals between sections must be adjusted accordingly.

4. The following movements will be practised:—

Advance in line.

Advance in column of sections (or half troops).

Advance in column of half companies.

Advance in column of route. (Plates I and II.)

Forming line on the left (or right) from column of sections (or half troops) or column of route.

5. A field engineer troop or company cannot reverse on its own ground: retirements should therefore be carried out from a flank by wheeling the flank section (or half troop) about outwards, the remaining section (or half troop) following. Wagon sections may be retired in accordance with Sec. 74, if there is sufficient space for the movement.

COMBINED DRILL OF MORE THAN ONE COMPANY (OR TROOP).

87. *General instructions.*

1. When more than one unit is drilling together, movements are carried out by a combination of company (or troop) movements.

2. The commander will place himself where he can best exercise supervision.

3. In line company (or troop) commanders will be in front of the centre of their companies (or troop) one horse-length in front of the section commanders, or in column formations, one horse-length in front of the leading section commander.

4. The adjutant and riding master (if on parade) will assist the commander as he may require.

5. The intervals between companies (or half troops in line) will be ten yards.

6. The following movements will be practised:—

• Advance in line.

„ „ column of companies (or troops).

„ „ „ „ half companies, sections (or half troops).

„ „ „ „ route.

Forming line on the right (or left) from column of companies (or troops), half companies, sections (or half troops), or column of route.

CHAPTER VI.

INSTRUCTIONS FOR PACK ANIMALS OF R.E. UNITS.

88. *Position of driver.*

1. On parade the driver stands to attention on the near side of his animal, holding the loop of the rein in his left hand, which should hang down by his side; while with the right hand he takes hold of the double rein about 6 inches behind the animal's jaw, keeping the animal's head in its natural position.

2. "STAND AT EASE."—Keeping both legs straight, carry the left foot about one foot-length to the left as at foot drill, and slide the right hand down the rein to the full extent of the arm.

3. "MARCH."—Every driver will at once step off as at foot drill, causing the animal to start off steadily at the same time by a gentle feeling of the leading rein. He will march abreast of his animal, and should rarely pull at the leading rein, as animals move best with a loose rein and require a light hand.

4. "HALT."—The driver halts as at foot drill, coming to the position of attention and halting the animal at the same time by a gentle pressure on the leading rein. Drivers should be taught to lead their animals from either side.

To salute when passing an officer, a driver should look towards him without moving his hand or altering his position.

89. *Fitting of saddle and equipment.*

1. The packsaddle should be placed fairly in the middle of the animal's back, clear of the play of the shoulders in front and of the hip bones behind.

2. The girths should be tightly buckled, but in no case should it cause the skin to wrinkle. After the load has been a short time on the back its weight will cause the girths to slacken, consequently they should be looked to, and drawn again after a time.

3. The crupper should not be tighter than is necessary to keep the saddle from slipping forward.

4. The breast collar, which is used to keep the load from slipping back, should hang horizontally from the neck straps, the lower edge just clear of the shoulder points. It should in no way confine the animal's movements, but should admit the breadth of the hand between it and the breast. The breast collar straps should be taken up before commencing a long descent.

5. The breeching, which is used to keep the load from slipping forward, should hang horizontally by the hip straps. It should in no way confine the animal's movements, but admit the breadth of the hand between it and the quarters.

6. The bridoon is placed in the mouth, and the head collar so buckled to it that it will close up to the edge of the lip, but cause no wrinkles or "gagging."

7. The leading rein is fastened to both rings of bridoon bit. The Ts of the rein passed through from inside to outside, the reins double in the driver's right hand, loop of rein in left hand.

The following method of attaching the rein to the bridoon bit may be adopted to gain more control over restive animals and to prevent animals from stampeding when under fire, etc. :—

- i. Pass one of the Ts of the rein through the near ring of the bit from inside to out.
- ii. Pass the other T through the off ring of the bit from outside to in and then through the near ring from inside to out.

The rein can now be used in the ordinary way; when, however, it is required to restrain a restive animal, or it is apprehended that animals may be frightened by coming under fire or otherwise, pull the T of the near rein, thus pulling the rein through the near ring of the bit, pass the loop of the rein in round the animal's nose and haul fairly taut. The rein is now single in the driver's hand, and when hauled on, compresses the animal's nose and stops him.

90. *Saddling and off-saddling.*

1. Before saddling it is essential that the animal's back should be free from dirt, and any dried sweat or matted hair combed out. The pannels should be examined, and having been thoroughly dried and beaten, freed from any grit or dirt. Neglect of these precautions is the most fertile source of sore backs. Constant attention must be paid to the stuffing of the pannels, and care taken to prevent it from becoming hard and lumpy.

2. In no case must the backbone be subjected to any pressure, but there should be an uninterrupted channel from end to end of the saddle to allow a free circulation of the air along the spine. The saddle is placed on the ground, resting on the front arch, pannels to the front, all parts of the saddle being attached to and turned over it as follows:—

3. First, the breast collar, attached to the off side front hook by the strap with the neck-strap unbuckled, is placed across the rear arch; then the girths, buckled to the off side, are placed over the breast collar; then the crupper and breeching, with the hip-straps loosely buckled to it and attached by the straps to both sides of the saddle, are turned back over the saddle.

4. On the order to SADDLE, the driver will stoop down and pass the right hand under the rear arch as far as the elbow, grasp the front arch with the left hand, then raise the

saddle, the pannels resting on his forearm, and lifting it well clear of the mule, will place it on the back, slightly to the rear; then, moving to the hind quarters, lower the breeching into its place, gather the hair of the tail into the left hand and put on the crupper with the right, taking care that no hairs are left under the dock-piece; then taking hold of the saddle by both arches, raise it slightly and put it in its proper position.

5. The girths will then be passed under the belly and will be buckled.

6. The breast collar will be passed under the neck and will be buckled to the **D** on the near side pannel. The neck-strap is then thrown over the withers and will be buckled at the required length to the buckling-piece, when the saddling will be complete.

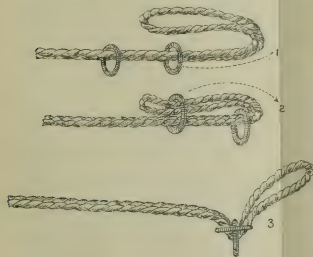
7. To off-saddle the neck-strap of the breast collar will be unbuckled, and the latter placed behind the rear arch of the saddle. The girths will then be unbuckled, folded in two and placed over the breast collar. The saddle will be lifted off by both arches slightly to the rear, the crupper then taken off and the breeching turned over on to the saddle. The driver will then place his right arm under the pannels, take hold of the front arch with the left hand, lift the saddle clear of the mule, face right about and place the saddle on the ground, resting on the front arch, pannels to the front, in the position in which it was before commencing to saddle.

91. *Loading.*

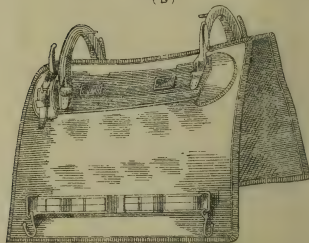
1. The load for a good mule is about 240 lbs., including the packsaddle; male mules carry more weight than mares, but the latter are more docile. It is essential that the load should be equally divided, in order to keep it in its place and cause it to ride steadily. It should neither be placed too high on the

PACK ANIMALS.

METHOD OF PUTTING ON BAGGAGE ROPE RINGS.



PACKSADDLE, G. S., WITH FRAME,
(B)



mule's back, for it will then "rock" unduly—nor too low, for it will then squeeze to the mule's sides and distress him.

The proper place for it is well on the mule's back, so that the weight will rest on the arch—the strongest part—of the mule's ribs, thus the load should not be lower than the side of the pack-saddle, and as little as possible should be placed above the back. No part of it should touch the animal. No package, if it can be avoided, should exceed the following weight and dimensions:—

Weight	-	-	-	-	-	80 lbs.
Length	-	-	-	-	-	30 inches.
Width	-	-	-	-	-	15 „
Height	-	-	-	-	-	20 „

2. Engineer equipment loads are either carried in racks, entrenching tool, or in Clarkson's chests. Other loads which sappers should be trained to make up and load are:—

- i. Ammunition in boxes.
 - ii. Provisions in cases of panniers, and forage in bales or sacks.
 - iii. Blankets in bundles.
 - iv. Camp kettles nested and carried in sacks.
 - v. Tents in their own bags, with poles on top.
 - vi. Kits
 - vii. Waterproof sheets
 - viii. Baggage and canteens of officers.
 - ix. Stationery cases.
 - x. Medical stores in panniers.
- } On special occasions only, roped in bundles.

3. Each pair of loading ropes is provided with four rings, two for each rope. The diagram (Plate III) clearly shows the manner of fitting them on for use. The advantage of them is that the projecting ring, which is hooked on to the hooks of the saddle, can be moved up and down the leather-covered

portion of the rope at will, in order to adjust the load and make it ride in its proper place. The connecting strap, which is about the same length as the distance apart of the fore and hind hooks, is a guide in fixing the distance apart of the rings when lashing up the load for carriage on the packsaddle.

In loading hard packages, such as wooden cases with sharp or rough edges, it will be found advantageous, both to prevent the lashings slipping and becoming worn, to put tufts of hay, straw or other soft material between the edges of the packages and the ropes.

4. Donkey bags are an easy means of carrying miscellaneous loads on pack animals, and if the load on each side is equally balanced they ride easily and require no lashing. They are readily extemporised, as they consist of what may be described as a large sack with the mouth sewn up and an opening made in the middle. The ends thus form two pockets, which are partially filled, so that the sack has merely to be thrown across the saddle.

A mule blanket can be utilised in this fashion by sewing up the ends to form two pockets, in which when necessary the animal's forage can be carried.

5. Roped loads must be made on the ground before saddling.

The ropes should be laid out on the ground with the rings in the position best suited to the load—experience will readily show this for the various kinds of loads—the distance from ring to rope end is the same for each rope. The load is laid upon the ropes the ends of which are drawn through the loops and drawn tight with a half-hitch at the end of the loop. Two men should tighten the half-hitches, one man taking up the rope as strained by the other. In loading pack animals with ropes much depends on the tightness with which the ropes are strained and secured.

6. Engineer equipment pack loads are loaded up as follows:—

The driver brings up his animal and stands to its head a few feet in rear of the loads. He should make certain that his girths are tight. The half loads are lifted simultaneously by a man at each end, carried back opposite the saddle, raised well up to the arches, and the chains hooked on. With the Clarkson's chests the surcingle is passed round the whole load and buckled on the near side. With the tool racks the thongs from the lower bar of each rack are passed under the horse's belly and made fast to the lower bar of the other rack but not strained tightly.

Two men can load up as follows:—

No. 1 should stand at the near side load. No. 2 at the off side of the mule holding the two arches of the saddle to prevent its being pulled over when the load is attached to the hooks, and the driver at the mule's head, holding the leading rein.

On the order being given to load, No. 1 will take up his load and lay it against the near side of the saddle, slightly raising the fore end by putting his shoulder under it, and guide the ring on the fore hook; then adjust the other ring to the hind hook and continue supporting his load. No. 2 now brings his load to the off side, raises it, and adjusts in the manner already described for No. 1.

92. *Leading pack animals.*

1. On good ground pack animals should always move closed up to their proper distance, but in going up or down hill and in crossing difficult ground the drivers will increase their distance and regulate their pace as circumstances may require. Should any animals appear distressed, they should be halted to enable them to recover their breath.

2. The driver should always give the animal a long rein when moving over rough or hilly country; this is quickly effected by the driver letting go the rein with the right hand, seizing the T-piece from the outside of the ring of the bit and pulling the rein through.

For ascents the driver must tighten the breastpiece and loosen the breeching of his animal, and for descents he will tighten the breeching and loosen the breastpiece. This can be quickly done without halting by means of the chain attachments of the breastpiece and breeching.

3. When a halt is ordered, any driver who has lost ground will continue to move with his animal until he has recovered his proper distance. Closing up to recover distance must be done steadily and by a gradual increase of pace, not by rushing. Trotting should not be allowed except by order.

When halting on hill roads, animals should be turned to stand level across the roads with their heads outwards from the hillside. If the width of the road does not admit of this, the drivers must stand to the head of their animals and keep them from turning, so as to avoid accidents.

4. It will happen sometimes on narrow roads that the driver must march in front of his animal. When this is the case, he must resume his position beside the animal and close up again to his proper distance as soon as the road widens sufficiently.

5. If a load becomes disarranged, the driver will fall out to the most convenient flank as soon as he can find room on the road, and when the load has been readjusted, he will, as soon as practicable, regain his place in column.

When a laden animal falls, its head should be held down to prevent it struggling, and the load must be removed before the animal is allowed to get up. In very difficult or dangerous ground the saddle should be removed as well as the load.

93. General remarks on pack transport.

1. When camel transport is used either local regulations and instructions for guidance exist or should be at once prepared for the force generally. Reference is made in A.S.C. Training to the practice followed in India and Egypt.

2. Average loads, exclusive of packsaddle :—

	Lbs.
Donkey - - - - -	100
Mule or pony - - - - -	160
Pack bullocks - - - - -	200
Horses - - - - -	200
Camels - - - - -	320-380

3. Pack animals should be loaded as shortly before the time of march as possible. Standing about under their loads fatigues them more than the actual marching, and should be avoided as much as possible. Engineer equipment pack animals should be unloaded at every halt.

The utmost care must be taken to adjust the loads evenly at starting.

Never overload a pack animal, it breaks him down more surely than long marches.

4. The preservation of animals from sore backs depends greatly on a careful management of the stuffing of the pads before taking the field, and whenever practicable the saddles once fitted to an animal should never be changed; but when mules lose flesh and strength from severe work and privation, it is necessary to add gradually and carefully to the stuffing in the pads; any sign of a sore back or wither should be met by adjusting the stuffing of the saddle so as to remove pressure from the affected spot.

5. Never let mules loaded, or with saddles on, stand about unattended. They seize any opportunity of rolling.

6. In hilly countries mules suffer much from lacerated docks; cruppers must be kept clean and well greased.

7. After a march the empty saddles of pack mules should remain on for a time; the girths should be slackened, but only slightly at first, to allow of proper circulation before the saddles are removed.

Carefully examine animals for wounds and injuries, their backs especially for galls, and treat them from the first. Neglected sores often become incurable, and it is better economy to throw an animal out of work, if necessary, for a day or two at first than to be deprived of its services for an indefinite period later on.

PART II.

EMPLOYMENT OF ENGINEERS IN WAR.

CHAPTER VII.

ORGANIZATION, COMMAND AND PRINCIPLES OF EMPLOYMENT.

94. *Organization and command.*

1. The engineers of the expeditionary force are divided into:—

- i. Cavalry divisional engineers.
- ii. Divisional engineers.
- iii. Army troops engineers.
- iv. Engineers on the lines of communication.

2. In addition to the above there may also be engineers allotted to the garrison of any land or sea defences in the theatre of operations, and to special formations such as a besieging force.

3. A brigadier-general, Royal Engineers, is attached to general headquarters to act as the technical adviser of the commander-in-chief on engineer questions; he exercises no executive command over the engineers of the army. A colonel, Royal Engineers, is similarly attached to the headquarters of an army.

4. The cavalry divisional, the divisional, the army troops engineers, and those mentioned in para. 2 above, are fighting troops as defined in F.S. Regs., Part II. Their commanders

are subordinate commanders, who receive their orders through the staff of the formation to which they belong.

5. The cavalry divisional engineers consist of a field squadron composed of a headquarters and bridging detachment, and four troops. Each troop is self-contained and may be attached to a cavalry brigade or other cavalry detachment as required.

The field troop consists of the engineers attached to a cavalry brigade not allotted to a cavalry division. It is a self-contained unit divisible into two half troops.

The divisional engineers consist of field companies organized as divisional units under the commander of the divisional engineers.

Each company is self-contained, and is capable of detachment in the same way as a field troop.

The army troops engineers consist of one or more bridging trains and such other engineer units as may be added for special purposes. They are directly under general headquarters and are distributed according to the requirements of the situation.

6. The engineers on the line of communication include:—

i. Engineers of the technical railway personnel.

ii. Engineers employed on constructional and maintenance duties.

These categories may include both military and civilian labour.

The engineer units on the lines of communication will usually be employed under the director of railways or the director of works.

7. The duties of the director of works and of the director of railways are laid down in "Field Service Regulations, Part II." The duties of engineers employed in railway work are described in F.S. Regs., Part II, the "Railway Manual War," and in "M.E., Part VI." The duties of engineers employed under the Director of Works are contained in the "Works Manual War" (in preparation).

95. *The principles of employment of engineers.*

1. Engineer work, to be of value, must be carried out in accordance with the requirements of the tactical situation and with the plans of the commander of the force concerned. Time is therefore an important factor, and if commanders are to get full value from their engineers the latter should receive an early intimation of their requirements; whenever this can be done without prejudice to the operations. Unless the engineer commander is so informed, there is always a risk that he cannot arrange for the execution of the necessary work in time.
 2. For the same reason the engineer commander of any force must take steps to obtain early and complete information of the nature and extent of such work as may be necessary. To ensure this he must organize engineer reconnaissances after consultation with the staff and arrange for the timely transmission of the information so obtained.
 3. The requirements of the commander of the force may exceed that which the engineer commander can carry out with the units at his disposal. It is then the duty of the latter to acquaint the former of the fact, since the commander of the force alone can decide the priority of the work and place such additional labour as is required at the disposal of the engineers.
 4. Engineers at work must always be prepared to defend themselves, and may, in emergency, be employed as riflemen.
 5. The number of engineers with a force being limited, care must be taken that they are, as a general rule, only employed for such work as demands technical knowledge or special tools. All arms must entrench themselves, not merely as working parties under engineer supervision, but as tactical units selecting and preparing their own lines of defence. (See F.S. Regs., Part I., Sec. 106-9.)
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CHAPTER VIII.

MOVEMENTS BY LAND AND SEA.—QUARTERS.

MARCH DUTIES.

96. *Engineer duties on the march.*

1. A proportion of the engineers should be placed well forward in the order of march, so that they may deal at once with any work needed. The majority of the divisional engineers are dismounted men and consequently they cannot be brought up rapidly from a position in rear. On the march the engineers will be accompanied by their technical vehicles, with the exception of those which carry bridging equipment, which will accompany the train unless it is likely that they will be required during the march.

2. Some engineers should normally form part of the advanced guard; their numbers should be relatively large if there is reason to anticipate much work on the road, but they will, as a rule, only undertake such work as is essential to ensure the unimpeded advance of the main body. If the advanced guard engineers become seriously reduced in numbers owing to their work, they should be reinforced from the main body.

3. Reports must be sent back to the advanced guard by parties sent on ahead to ascertain the details and position of the work required. These parties, each of which should, if possible, be accompanied by an engineer officer, should be as far to the front as possible. The object is to gain such definite information that there will be no delay in starting the work, and that comparatively unimportant work may not be undertaken through ignorance of the existence of greater difficulties ahead. It may therefore be sometimes advisable for an engineer officer

to accompany cavalry reconnoitring detachments. In any case the engineers with the cavalry should collect and transmit such special engineer information as may be of use to the main columns marching in rear.

4. In order to provide for future contingencies, notes should be made on the resources as regards materials and tools along the route passed over. This applies particularly to cases where an eventual withdrawal may be contemplated.

5. The work of the divisional engineers when on the march will generally come under one or other of the following headings* :—

- i. Clearing away obstacles.
- ii. Repairing roads, marking and improving fords, or making roads across swampy places.
- iii. Bridging streams, rivers or ravines.
- iv. Improving communication generally.
- v. Arranging temporary water supply.

6. The amount of work which can be done must be governed by the circumstances of each case, since the divisional engineers will be required to keep up with the fighting troops of their division. But the commander of the engineers of a division is responsible for carrying out all work required to facilitate the movement of the transport of the division when on the line of march. Subject to this proviso, work of a substantial, or semi-permanent nature, should be left for the engineers employed on the lines of communication, or it may be executed by hired or requisitioned local labour.

7. The bicycles with each company of divisional engineers will enable small parties to be sent quickly to carry out work at a considerable distance, either ahead of the column, or in connection with flank guards and other detachments. The men

* For the duties of engineers in retreat, see Sec. 115.

can carry the necessary tools, &c., and their arms on their bicycles, but if possible tool carts should accompany them.

8. During a march arrangements should be made, when the military situation admits, for sending on parties to prepare the water supply at the place where the force will be quartered for the night.

97. *March discipline,*

(See F.S. Regs., Pt. I., Chap. III.)

1. March discipline includes everything that affects the efficiency of man and horse during a march. On it depends not only the comfort of a column of troops as a whole, but also the time which is needed to perform a march or deploy for battle.

2. Dismounted parties will march as directed in "Infantry Training." Men carried on vehicles and temporarily dismounted will march directly in rear of their vehicles. They will never march on the off-side of vehicles.

3. Mounted units and vehicles will march in column of route on the left side of the road. The regulation distances between vehicles must be maintained. When a halt is ordered vehicles will be drawn up on the left side of the road. Cross roads must be left clear.

4. On a march the first halt usually takes place not long after the start, when a careful examination should be made of the horses and harness. Subsequent halts are made at regular intervals of about an hour. The duration of these halts should be made known in advance.

5. It is of great importance to relieve horses as much as possible of the heavy weights they have to carry. They should be harnessed up as short a time as possible before turning out, and should not be hooked in until just before the time for marching off.

When they are standing in harness the drivers should be dismounted.

When marching at a slow pace with other troops men are inclined to lounge in their saddles and thus to cause sore backs. On this account mounted men should be instructed to walk and lead at intervals. For the same reason slouching in the saddle, even when riding at ease, should be prevented and, when trotting, every man should rise in his stirrups.

6. Opportunities which may occur for watering and feeding horses should always be seized. Watering requires to be carried out on a regular system if it is to be done smoothly and expeditiously.

PASSAGE OF RIVERS.*

98. *General considerations.*

1. Engineers may be called upon to help the passage of troops across rivers, streams, &c., over which insufficient means of passage exist.

The engineer work in this connection will usually come under the following headings:—

- i. Reconnaissance.
- ii. Construction of bridges from the equipment carried.
- iii. Construction of bridges from materials found locally or brought up for the purpose, either to replace an equipment bridge, or an account of the absence of sufficient equipment.
- iv. Improvement of existing means of passage.

2. The bridging equipment carried with engineer units should be looked upon as material for temporary use. It is provided to enable bridges to be constructed rapidly according to the tactical exigencies of the case. Whenever there is a probability of such

* For details as to the construction of floating and other bridges, see "Military Engineering, Part III."

a bridge being required for some time, it should be replaced by a bridge of other materials as soon as possible so as to set free the equipment for use elsewhere.

3. When large bodies of troops have to pass a river, it is the duty of the general staff to see that separate bridges are, whenever possible, provided for infantry traffic and wheeled traffic. Columns of infantry, artillery, wagons and cavalry should not be mixed together when crossing a bridge. The bridge with the easiest approaches and exits should be allotted to the wheeled transport.

4. The staff should also arrange for forming-up places away from both banks of the river. That on the near bank will be used for marshalling the traffic prior to passing the river. That on the far bank should be used for assembling units after the passage.

99. Selection and reconnaissance of the point of passage.

1. An engineer officer should always take part in the reconnaissance of a river with a view to selecting points of passage, since the technical difficulties of construction may affect or modify decisions which have been come to on tactical grounds alone.

2. When not in the presence of the enemy the selection of the point of passage will be made by the commander of the force chiefly with reference to the ease and rapidity of crossing his troops over the river. A reconnaissance will be necessary in order to ascertain the number and nature of the crossings, and the roads leading to and from them. The engineer officer with the reconnaissance would be required to note the depth, width, current, nature of banks and of bottom, watering places, crossings, and their descriptions, boats and materials available for rafts and construction of temporary bridges, navigability, rise and fall of water, bridges, ferries, fords, locks, &c., and any work necessary to enable the troops to approach or leave any

crossing. This information is necessary in order to decide on the localities where bridges could be constructed if required, their nature and the time it would take to make them. In some cases the amount of local civilian labour available should be ascertained.

3. When in the presence of the enemy, the selection of the actual point of passage must be made on grounds that are both tactical and technical. The tactical considerations are the more important except where the technical difficulties involved are so great as to be insuperable. When reconnoitring for a place at which a passage is to be made in the presence of the enemy the points to note in addition to those given above, are:—the relative command of each bank; the support which can be given by the artillery; the best line of concealed approach for the bridging equipment, infantry, &c.; where the bridge can be made out of view of the enemy, or under cover from his fire; the debouches for the bridge; the covering position which can be occupied by the first troops sent across.

Circumstances may necessitate the river being approached and the bridge being constructed under cover of darkness; in this case the routes to the river must be reconnoitred and marked. Also, the best place must be selected at which to construct the bridge during the night; this need not necessarily coincide with the actual site of the bridge, but it may be some place easy of access, from which the rafts, &c., may be floated to the point of crossing, either in the darkness or at daybreak.

4. In the absence of sufficient equipment or materials for making a bridge, it may be necessary to cross a river by means of boats, or rafts collected on or near it, by fords, by swimming, or on the ice. The places at which such passage will be made will be selected in accordance with the principles indicated in the preceding paragraphs.

5. The reconnaissance for the collection of sufficient boats will often have to be an extensive one and the engineers may

require assistance from the cavalry. All parties employed on the reconnaissance should be informed of the nature of the boats and materials which will be required. The place to which the materials are to be sent and the route by which they should arrive must be given, and arrangements made for transport, if necessary through the quartermaster general's branch of the staff. The selection of the route along which boats are to be taken to the site of the bridge will depend on the tactical situation and on the degree of secrecy required. If the construction of the bridge is to be secret it may be advisable to use only boats collected on some tributary of the river to be crossed, or it may be necessary to arrange to transport boats over land, under cover of the advanced troops.

6. A ford must be crossed before it can be reported as passable. The course, both ends, and the depth of a ford must be noted, and any obstructions on the bottom which require removal. The level of the water at the date of the reconnaissance should be given, by reference to some easily recognisable object, or by the erection of a notched post.

7. A place at which it is proposed to swim horses across the river should afford easy access to and egress from the water. In case a horse is carried down stream a supplementary landing place is required on the far bank. The amount of work necessary to allow horses to enter or get out of the river with ease should be noted.

8. When reconnoitring a frozen river it is necessary to decide what traffic the ice will carry, to find a place where the edges of the ice are sound, and to mark a route on the ice, ensuring that throughout the ice is supported by the water and free from air-holes.

100. *The employment of a bridging train.*

1. A bridging train, carrying pontoons and trestles, forms part of the army troops, and it receives orders from general or

army headquarters. If necessary it will be attached to such formations as may have to undertake the passage of a river when the equipment with the formation does not suffice. When not so attached it will march in rear of the army as ordered by general headquarters. The personnel of the bridging train is insufficient to construct bridges.

2. When the whole or a portion of the bridging train is so attached for the construction of a bridge, the commander of the engineers of the formation concerned will inform the commander of the formation as to the engineer and other military labour required for the construction of the bridge; the latter will then issue the necessary orders. He must also arrange for the engineer maintenance party whilst the bridge is in use, and for taking it up if the bridging train is to accompany the formation as soon as it has crossed the river. If the bridge is to remain down, instructions will be issued by general or army headquarters regarding the maintenance party to be left behind with it.

101. *Maintenance of a Bridge.**

1. In order to maintain an important bridge in working order it is necessary to keep ready a sufficient working party to guard against, or repair, damages, whether from accidents, constant traffic, floods, or efforts to destroy it by floating down heavy timber and rafts. The commander who orders the construction of a bridge is responsible that suitable arrangements are made for its safety and maintenance. A watch should be kept on the river, for some distance both up and down stream, and arrangements made to divert any flotsam which would damage the bridge. On a river liable to sudden rises of level, an observation post should be established to give sufficient warning of any rise.

* The rules for traffic across military bridges, fords, &c., are contained in "F.S. Regs., Part I."

2. It may be necessary to arrange for openings in the bridge to allow river traffic through. These openings should be marked so as to show their position and, where necessary, guard boats should be used to give warning of and control the traffic. This traffic must be subordinated to the needs of the traffic across the bridge, and it must not be allowed to interrupt the passage of a column. It may be necessary to restrict the river traffic to certain hours, and in a hostile country unauthorised boats should not be allowed to approach a bridge.

EMBARKATIONS AND DISEMBARKATIONS.*

102. *Engineer work in connection with disembarkation at a seaport.*

1. In a friendly country a port or ports will usually be available at which to disembark. Engineer work meant to facilitate the disembarkation and the subsequent entraining, or marching, of the force will have to be undertaken with the sanction of the responsible local authorities of the country in question. It may often be possible to foresee and arrange for much of the necessary work beforehand.

Arrangements must be made to commence work directly the decision is arrived at to utilise the port, and the despatch of the engineer personnel, labour, and stores required would be amongst the first steps to be taken. Much of the labour employed at the port may with advantage be civilian.

Amongst the works which would have to be arranged are the following, which would be organized by the directors of works, railways, and army signals, under the orders of the inspector general of communications:—

- i. The improvement of the piers, wharfs, derricks, pier and wharf accommodation, exits from the docks, &c.
- ii. The provision of suitable entraining accommodation.

* See also F.S. Regs., Part I.

- iii. The improvement, and marking of roads in the docks and town, and the marking of the routes to camps and depôts.
- iv. The provision of water supply and sanitary services for quarters and at the docks.
- v. The conversion of such buildings as may be required into hospitals, stores, sick lines for animals.
- vi. The erection and maintenance of suitable telegraphic or telephonic communication.

2. When effecting a landing in a hostile country it may be possible to seize a suitable port at which to disembark the major portion of the force. Should this be the case the first engineer work will be that necessary to provide defences on the land side, but the improvement of the landing facilities must be begun as soon as possible. These defences should fulfil the following conditions :—

- i. They must protect the harbour, stores, etc., against artillery fire.
- ii. They must include a sufficient area to permit of troops being accommodated within the perimeter.
- iii. They should include such features of the ground as will allow the troops to debouch from inside the defences.
- iv. A line of defences should be prepared to protect a possible re-embarkation in the face of the enemy.

The best defence of the base will, however, be provided by the action of the field army, and the engineers of that army must not be depleted. A great amount of the defence work indicated could be carried out by local civilian labour if obtainable.

103. *Disembarkation on an open beach.*

1. The nature and relative importance of the engineer work in connection with a landing on an open beach must depend

chiefly upon the plans of the commander of the force. The rapidity of the work will depend on the previous reconnaissance, on the way in which the work is organised and on the proper stowage of stores. When embarking, all equipment required off the ship first, must be so stowed that it can be unloaded at once. The engineer personnel available would include not only the units of the field army, but also such units as may be detailed for service at the base, and on the lines of communication for the execution of such work as is anticipated. The whole would, during the landing operations, work under the orders of a senior engineer officer nominated for the purpose by the commander of the force about to disembark.

2. Such preliminary reconnaissance as is necessary and possible will be carried out by or under the instructions of the staff. The engineer work will normally include some or all of the following :—

- i. The improvement of communications, the preparation of exits from the beach, the improvement of the surface of the beach, the marking of routes to and from the beach, the provision of water, the provision of jetties and piers, the provision of sanitary services.
- ii. Such defences of the landing places as might be required should be prepared on the same principles as those for the protection of a harbour (Sec. 102).

104. *Slinging horses.**

(Transports alongside.)

1. If horses are to be embarked by slinging, they should on arrival alongside the ship be unsaddled or unharnessed, the head-rope should be fastened in the ordinary way round the neck; the ship's halter will be put on under the head-collar; the bridoon reins should be left loose (as they may be required

* For other methods of embarking and disembarking horses and for care of horses on board see "Animal Management."

for keeping the head in the proper position while lowering down the hatchways), but they should be knotted to prevent them getting entangled in the horse's legs. Slings should be minutely inspected before the embarkation begins. A double guy should be made fast to the horse's head, one end being held on shore and the other on board, in order to keep the head steady.

2. In slinging horses, five men are required, one at the head, one at each side, one at the breast, and one behind. One end of the sling is passed under the horse's belly, and both ends are brought up to meet over his back; one man passes his loop through the other loop, and it is received by the man on the other side, who hauls it through, hooking the tackle to it, both men holding up the ends of the sling until it is taut. The men at the breast and behind bring their ropes round and make them fast to the grummets, and the man who holds the horse's head makes fast the guys to the ship's head-collar. The breech band and breast girth must be securely fastened. Timid or restive horses should be blindfolded. When all is ready, the word "HOIST AWAY" will be given, and the horse is to be rapidly run up from the ground to the necessary height, and then carefully lowered down to the hatchway. Two or three men should be stationed at the hatchway and between decks to guide the horse in being lowered. A soft bed of straw or coir mats must be provided for the horse to alight upon, and the men stationed in the lower deck must be ready to receive him and take off the sling, as on first feeling his legs, unless firmly handled, he is apt to plunge and kick violently.

3. In disembarking, sand or straw must be laid on the wharf for the reception of the horses. Horses are apt to fall on their knees at once unless carefully held up.

(Transports not alongside.)

4. The method of embarking horses in boats or flats will vary according to circumstances. If the boats can come along-

side a wharf, or can approach close to an open beach, the horses can either be led on board by gangways, or be slung in the manner described above, sheers or a derrick being erected. When the boats cannot come sufficiently near the shore to enable horses to be hoisted on to them, piers or platforms must be constructed. The piers should always be provided with stout side railings about three feet high, and the floor covered with shingle, or something to prevent the horses slipping.

5. When embarking in boats, the detachment should be formed up opposite them, and the same rules, so far as practicable, followed as when embarking in vessels alongside a wharf. A man must be told off to each horse, and take with him in the boat the whole of his kit, equipment, saddlery, etc. The men should take off arms, belts, and spurs. The horses should, if possible, be placed athwart the boat alternately, the head to tail. Each man must hold his horse until the vessel is reached. Sand should be put in the boats to prevent the horses slipping.

6. In the absence of boats and appliances, the following method of embarking horses by swimming may be employed:—

The horses having been halted a short distance from, and out of sight of, the point of embarkation, are stripped of all appointments except the bridoon and headstall, which latter should be close fitting.

A horse having been led to the landing place, two men prepare him for the water. No. 1 holds his head, No. 2 places the sling in position and secures the straps with yarn, so as to prevent the sling opening in the water; he then fastens the breast rope and breeching securely. A rope of about eight yards in length, with an eye at one end, is next passed round the neck and fastened rather tightly by an overhand knot, so as to prevent its becoming either looser or tighter. The bridoon is then taken off, and to support the horse in the water another rope is attached to the lower ring of the headstall under the

chin, or else a short rope is passed round the girth in front of the sling and close behind the elbows, the ends being brought up and fastened over the withers. The horse is controlled altogether by the neck rope.

The horse is then led into the water as far as he will walk towards the boat, in the stern of which should be a man, who receives the neck rope in his right hand, and immediately reeves it through the stern ring of the boat to secure additional power in the event of the horse plunging; the headstall or girth rope he receives in his left hand.

When once the horse is swimming, the neck rope should be hauled close up while the headstall or girth rope gently supports him in the water.

A small rowing boat with two oars will be sufficient. It should not be pulled too fast, or the horse will make no attempt to swim.

On reaching the ship's side the hook and tackle should be lowered, the hook passed through the sling's eye, and the horse hoisted up on board.

Care should be taken to arrange the tackle so that the horse, in being hoisted in, is kept clear of the ship's side.

7. Horses may, in cases of emergency only, be disembarked by swimming. When this method is adopted, the horse should be lowered in the sling over the side of the vessel without fastening the breast rope or breeching. When the tackle is unhooked the sling opens, and is at once slipped from under the horse. The neck rope should be hauled up and secured, and the horse supported, as explained above. If necessary, four horses may be made to swim ashore at a time, two on each side of the boat. It is important that horses should be kept at the point to which others are to swim.

Horses should be cool before being put into the water.

105. *Slinging vehicles.*

1. For slinging limbered wagons the following method has been found to work well:—

Two four-inch slings are used, one round each axletree. They are passed round each axletree under the drag washers, which must be turned down to prevent them from slipping. A rope is then secured to the trail eye; or to the pole at a point about one-third of the pole's length from its point. This sling and rope are then secured to the tackle hook. The rope should take sufficient of the weight to prevent the wagon from tipping backwards.

Limbered wagons will, as a rule, be embarked loaded on their wheels, the poles should not be removed before slinging. If the wheels are removed, special care must be taken that the linch pins and washers are put away. Those carriages first required on disembarkation should be stowed away last.

2. G.S. wagons can be slung by four chain slings connected to a common link at the one end and provided with hooks at the other, these four hooks are then secured to all four wheels of the vehicle. The poles must be removed before slinging, and *made fast to the body of the wagons.*

If cordage only is available, two slings, each consisting of one rope 3 in. by 60 ft., knotted at a suitable length, and two lashings, 1½ in. by 30 ft. for guy ropes, are required.

To adjust the front sling pass one end inside the wheels and under the futchels of the fore carriage in front of the axle. To adjust the back sling loop one end of the sling over the nave of the off hind wheel. Pass the sling over the load and loop the other end to the nave of the near hind wheel. Care must be taken to see that the drag washers are turned down to prevent the sling from slipping off.

The hook of the hoisting tackle is then passed through the end of the two ends of the front sling and under the centre of the back sling.

The pressure can be taken off the sides of the carriage by making use of loops made with polechains or ropes at the end of poles through which the slings are passed.

TRANSPORT BY RAIL.

106. i. *General instructions.*

The transport of troops in peace by land and sea is dealt with in the "King's Regulations." Owing to the variations in size of carriages and trucks in the different countries where campaigns may take place, it is impossible to fix the number of vehicles or trains required for various engineer units.

Rolling stock, such as in common use in the United Kingdom, will take :—

8 men with their equipment in each compartment. .

7 harnessed or 8 unharnessed draught horses in a cattle truck.

2 pairs of wheels on the average wagon truck.

The number of vehicles in a train varies on different railways, according to the ruling (*i.e.*, maximum) gradient, speed, and the types of locomotives and trucks.

In the United Kingdom a field troop requires one train, a field company one train, and a bridging train 4 trains. The following are the principal points to which attention should be paid when loading horses, etc.

ii. *Horses.*

The horses should always be packed in as tightly as possible. For short journeys they are put standing across the trucks, all facing away from passing trains and with their heads tied up short. When they travel harnessed, the bits are taken off and nosebags are secured to the truck rails in rear of the horses. For long journeys horses travel better loose in the trucks.

They should be taken out at least once every 24 hours, walked about, watered, fed, and allowed to roll on sand or grass.

Floors of trucks, if of wood, should be at least $1\frac{1}{2}$ inches thick. Cinders or gravel should be put on them to prevent horses slipping, particularly in the case of iron trucks, but on no account should straw or any inflammable material be used for this purpose.

iii. *Vehicles.*

The general points which should be attended to are:—

To distribute the load evenly over the floor, and if any of the flooring planks are rotten, to put a sleeper across them under the wheels. The minimum thickness of floor should be 2 inches.

To see that the points of poles or shafts do not stick up so that they would strike against bridges, etc., as would usually occur if they were more than 7 feet above the floor of the trucks.

To lash the wheels nearest to the ends of the trucks securely to the false buffers or to rings by a rope, which is also given a turn round the axle of each pair of wheels on the truck to prevent them shifting with the jerks of the train.

Generally the best way to stow the carriages is, poles, trails, and perches resting on the floor, poles to the front, perches and trails to the rear, the wheels of each vehicle interlocking with those of the carriage in front of it.

QUARTERS.

107. *General principles.*

1. Quarters take the form of billets, close billets, bivouacs, and camps, temporary or standing. The engineer work will in all forms of quarters be comprised under the following heads:—

- i. Co-operation with the other arms in defence works.
- ii. Improvement of roads. etc.

- iii. Work in connection with water supply.
- iv. Construction of huts, stores, etc., in standing camps or in siege operations in case of prolonged occupation.
- v. Lighting, and drainage.

2. The considerations which determine the form of quarters to be occupied by the troops are given in "Field Service Regulations," Part I. The selection and distribution of quarters will be made by the staff. The engineer work mentioned above is given in its normal order of importance in an ordinary civilized country, but circumstances, or the comfort and health of the troops, may require that a different order of importance be attached to these duties. The work will be the same both in temporary halting places and in standing camps, though it will vary according to the time available.

108. *Water supply.*

1. Engineer duties as regards the provision of water for a force will differ considerably in different countries or climates.

In a civilized country where water is abundant the engineers will not be required to do more, when on the line of march, or in the presence of the enemy, than to increase the facilities for watering in cases where it is difficult for units to make their own arrangements. On the other hand it may be difficult for an army to operate in a given tract of country owing to the deficiency of water. In this case the provision of water would be of paramount importance and all the efforts of the engineers may have to be directed towards this end. It follows that the provision of water supply will not necessarily be one of the first duties of engineers, though circumstances may make it one of the first importance. In this respect, as in all other cases, the tactical situation, and the work required in consequence of it, are the only guides to the commander of a force in the employment of the engineers.

3. When a force is halted and is not in proximity to the enemy, then the health and comfort of the troops are the first consideration. In these circumstances work in connection with water supply might be amongst the first duties to be undertaken by the engineers.

4. The responsibility as regards water supply arrangements is fixed as follows :—

- i. The medical officers are responsible for advising the staff as regards the suitability of water for drinking and cooking purposes, and they also advise regarding its purification or distribution.
- ii. The engineers are responsible for arranging for such work as is required in accordance with the orders of the commander of a force for the collection and storage of water and for making drinking water easily accessible. They advise the staff as to the most suitable general arrangements regarding water supply in any camp, etc., and provide, erect, and maintain any necessary pumps, tanks, troughs and piping.
- iii. The duties of R.A.M.C. personnel with each unit are the supervision of the water drawn by the unit and its purification for drinking purposes by boiling, filtration, or the addition of chemicals. They also take charge of all apparatus and stores connected with the water supply of the unit.
- iv. Any unit drawing water, using horse troughs, etc., erected for use in a camp is responsible for the labour necessary to pump up or obtain the amount of water required by the unit.

5. The water supply will usually be marked with flags :—

White for drinking water.

Blue for watering places for animals.

Red for washing or bathing places.

6. When on the march, the engineers required to undertake water supply duties should either be with the advanced guard, or, if possible, should precede it with the billeting parties. This party, in charge of an officer, should accompany the staff officer who selects the halting place, and should start work directly it has been decided upon.

7. Should circumstances render a long halt necessary during a day's march, arrangements will have to be made for the methodical distribution of water to the force during the halt.

8. When a force marches out of a camp, it will generally be necessary to keep some of the water supply stores in use until the last minute. As their removal will involve the retention of a party of engineers and of a certain amount of transport, it is obvious that the numbers of these stores should be reduced to a minimum.

9. A force in billets will usually obtain its water supply from the sources used by the inhabitants, but the engineers will probably have to increase the facilities for watering animals.

10. Engineer officers must acquaint the staff of the number of animals which can be watered simultaneously at the watering places, so that time tables can be made out for the troops to attend.

11. A daily average of 1 gallon per man is sufficient for drinking and cooking purposes. A horse, bullock, or mule drinks about $1\frac{1}{2}$ gallons at a time. In standing camps, an average allowance of 5 gallons should be given for a man, and 10 gallons for a horse.

12. For all details regarding the quality, supply, distribution of water, and for methods of raising it and boring for it see "Military Engineering, Part V, Miscellaneous."

CHAPTER IX.

THE EMPLOYMENT OF ENGINEERS IN BATTLE.

109. *General considerations affecting engineer work in battle.*

1. Engineers are only effective in conjunction with the other arms, and all their efforts must be directed towards assisting the latter to secure decisive success, and the destruction of the enemy, which is the final aim of all military operations.

2. Engineer work must be directed so as to aid the other arms in carrying out the orders of the commander, and the object at which it aims will differ according to the commander's intentions. For instance, in an offensive battle, a portion of the attacking force may be detailed to play a purely defensive rôle, or to attack with the object of pinning the enemy to his ground, whilst the remainder of the force is utilized for the decisive attack. The rôle of the engineers attached to any one of these portions of the force will be to help it in attaining its object.

3. A commander may fight a defensive battle in a deliberately chosen position, or may, through loss of the initiative, be compelled to meet the enemy's attack on whatever ground is to hand. The principles governing the employment of the engineers will be the same in both cases, but the work will vary in degree according to the time available for its execution. In both cases the object to be aimed at is the strengthening of the position with a view to increasing the number of men who will be available for the ultimate offensive.

4. Engineer officers, in order to carry out their work effectively in co-operation with the other arms, must have a clear grasp of the intention of the commander of the force to which they are attached. Their work must also be conducted

in accordance with tactical requirements, and this calls for an intimate knowledge of the tactics of the other arms, combined with a power of rapidly applying this knowledge to the progress of the fight and to the ground. Engineer labour, being limited, must be distributed with foresight and confined to essentials. Every officer must execute any obviously necessary work on his own initiative, in order to forward the general plan; but the greatest care should be taken not to tire the men out with work of only temporary importance when the situation may really demand that they should be kept fresh for work likely to become necessary later in the day.

110. *Distribution and command in the attack.*

1. Though a central control of engineer work may lead to an economical distribution of engineer labour, yet, in the attack, it will not usually be possible for a commander of divisional engineers to exercise continuous control over the engineer units. It will generally be necessary to attach units, or portions of units, to act under the orders of commanders of portions of the force. No considerable portion of the division, ordered to carry out a distinct tactical operation, should be without its complement of engineers.

2. The actual strength of the engineers detailed to each portion must depend on the engineer work necessary. Since this requires some knowledge of the work needed, the importance of previous engineer reconnaissance is clear.

When definite information as to the work required has been obtained, and the engineers have been distributed in accordance with the orders of the commander, they should be placed as far forward as possible, so that the work may be begun with the least possible delay.

3. When a previous reconnaissance has not been possible, it is advisable for some engineers to move with the advanced troops for the purpose of doing such work as may be required

immediately, and of reconnoitring and ascertaining what obstacles exist. These advanced engineers may sometimes be divided into several parties, but the distribution must be guided by the actual circumstances of each case. The remainder of the engineers may suitably move immediately behind the supports, ready to undertake such work as may prove necessary.

4. The engineers in an attack will be accompanied as long as possible by such technical transport as may be required. Other technical transport will be left in some convenient place should there be no prospect of its being required at first. When, for any reason, it becomes impossible to take the transport further forward, then the tools, explosives, etc. must be carried forward by the men.

5. Engineers should rarely be kept with the general reserve unless for some definite purpose such as the organisation of the defence of some important point in rear, or unless it can be foreseen that they may be required to assist the general reserve in its attack. Engineer work to be useful must be executed in time and this is impossible if the engineers are kept too far back.

6. Engineer units allotted to a brigade, etc., for the purpose of carrying out a distinct tactical operation come again under the command of the commander of the divisional engineers as soon as that particular operation is concluded, unless the brigadier, or other commander, takes upon himself to retain their services. In this case the unit commander, whilst complying with the brigadier's order, will report the fact to the commander of the divisional engineers.

111. *Engineer duties in the attack.*

1. The work of the engineers in an attack may be of the following nature:—

- i. Assisting the various arms to cross rivers, streams, difficult country, etc.

- ii. Strengthening ground won, and entrenching special points, to help in resistance against a counter-attack, or to serve as pivots of manœuvre.
- iii. Removing or destroying obstacles prior to the final assault.
- iv. Improving and marking communications.
- v. The erection of observatories.
- vi. Water supply.
- vii. Fighting when required.

2. The question as to which of the above duties is the most important is one that can be decided only on the spot according to the circumstances of each case. During the progress of an attack the engineers may have to carry out many of the above duties, and the work to be of use must be effected at the right time and the right place. In order to do this the progress of the fight must be carefully watched. In the ever varying phases of the modern fight it is impossible to issue orders on all occasions, and every officer is responsible for carrying out on his own initiative any work which the situation demands, provided that no work which might hamper the movements of our own troops, such as blocking roads, destroying bridges, etc., is carried out without the authority of the commander concerned. Preparations may be made for such work pending the receipt of authority.

3. During the preliminary stage of the attack there may be some serious obstacles such as streams, canals, broken country, etc., which may impede the progress of the force. The selection of the actual points at which these obstacles are to be crossed becomes a tactical question dependent on the ground, the necessity for concealed approach, etc., and the engineers detailed for the work must proceed in the closest co-operation with the troops concerned. In any ordinary country the troops can generally clear their own way across country, but, in exceptional

circumstances, it may be necessary to detail engineers to help them.

4. Engineers can often be of assistance by helping to strengthen ground captured against a counter-attack. All important tactical points should, when gained, at once be put in a state of defence, so that attempts on the part of the enemy to re-capture them may be defeated, and that they may serve as supporting points to the attack. This duty will often fall to local reserves, to which engineers may be attached. The only criterion of such work is its tactical suitability.

5. When a fight extends beyond the hours of daylight, entrenching in the front line may have to be done at night. Whenever possible preparations must be made for selecting and marking the sites of trenches, obstacles, etc., before dusk, so that the working parties may be extended in the dark. The entrenching will generally be done by other troops, but the engineers can assist with work demanding skilled labour or supervision. The above work may often have to be done by the reserves, or by troops ordered to relieve those in the advanced positions. This will entail movement by night, and preparations must be made for it, by improving and marking the communications.

6. Many of the improvements to communications must be executed by the troops themselves, but the engineers may be required to assist. The preparation of good and concealed approaches for the reserves, either local or general, is often a tactical measure of importance. It may occasionally be necessary to enable supply wagons to come up to the front during the night.

7. In an attack on a prepared position the advanced troops may be stopped by obstacles. The destruction of these obstacles is a duty which may be allotted to the engineers. The methods to be employed depend on the nature of the obstacle, but the final assault can rarely be made until they have been removed.

Engineers should accompany the assaulting lines, prepared to aid in crossing wire entanglements, abatis, ditches, etc., and to use hand grenades.

8. In an ordinary country all arms should arrange for their own water supply. In a waterless country, however, the provision of water may demand special arrangements and necessitate the employment of the engineers.

9. Directly the enemy's main position is captured, the engineers, in conjunction with the troops available, must strengthen it against counter-attack, and should improve the communications to it, and within it.

112. *Organization of work in a defensive position deliberately taken up.*

1. The general line to be held by a force will be decided by its commander. An engineer officer will, if required, accompany the commander or the general staff, on the reconnaissance of the position. The principles of the defence are given in "Field Service Regulations," Part I. After a decision has been reached as to the limits of the position it will, if extensive, be divided into sections, and troops will be allotted to each section. The commanders of these sections will be responsible for the defences of their sections, and all the troops under their command will be employed on the preparatory work as required.

2. If the commander, or the general staff, cannot reconnoitre the position, the commander of the engineers may be called upon to carry out the reconnaissance and to submit proposals for the defence and for the distribution of the troops.

3. The distribution of engineer units to sections, and also to such special work as may be necessary, will be ordered by the commander of the force. The commander of the engineers is under the commander of the force responsible for arranging the collection of and the allotment of such extra tools, materials, etc., as may be available to the section commanders; for the employ-

ment, distribution and supervision of military and civilian labour, not allotted to sections; and for all engineer work not specially detailed to other commanders.

The duties of the senior engineer officer under a section commander are similar to those outlined above for the commander of the engineers. He will, in addition, organize field workshops for the repair of tools.

4. It may be decided to allot some engineers to the force which is to initiate the assumption of the offensive. Since the success of such an attack may depend on the rapidity of its movement, the engineers may be employed on such works as will aid its movement and also as has been described in Sec. 111.

113. *Engineer duties in defence.*

1. Troops detailed to the defence of a position are responsible for siting and excavating their own trenches, defences, etc. Amongst the work of the engineers will be the following:—

- i. The execution of work requiring technical skill.
- ii. Technical advice when required.
- iii. Construction of overhead cover, if desired.
- iv. The construction of mechanical alarms, signals, flares, land mines, etc., and demolitions.
- v. The blasting and removal of all ground too hard for the infantry to deal with.
- vi. Assistance in revetments, and drainage arrangements.
- vii. Assistance in the construction of obstacles.
- viii. The collection and distribution of materials and tools other than those belonging to units.
- ix. The laying of tramways (except in artillery batteries).
- x. Water supply.

2. The commander of the engineers with each portion of a force must keep in close touch with the course of the fight, and be ready to carry out any work which may be ordered.

114. *Duties of engineers in co-operation with cavalry.*

1. All the troops of the field squadron may have to be concentrated for :—

- i. The passage by the cavalry division, or by a considerable portion of it, of a large river or other obstacle.
- ii. The defence of an extensive position.
- iii. Extensive arrangements for water supply, cantonment or camps for the division.

The work ordinarily required from a troop attached to a brigade would be :—

- i. Strengthening localities to be held as pivots of manœuvre, defences of billets, bridge-heads, etc.
- ii. Assistance to advanced or rear guards in removing or creating obstacles, improving or blocking river crossings or roads.
- iii. Demolitions of a considerable nature.
- iv. Water supply in quarters or on the march.

2. Owing to the great dependence of modern armies upon railways and the serious consequences of any interruption of the line, it is possible that the engineers may be called upon to interrupt one or more of the enemy's lines of communication. The selection of the point where interruption is to be made must be sanctioned by the commander of the cavalry division, acting under such orders as he may have received from general headquarters.

3. It may be expected that all important bridges will be guarded, but in enterprises of this nature, the fewer men there are in the party, the greater will be the chances of success. On the other hand, a small raiding party cannot carry out any very large demolitions, owing to the difficulty of carrying sufficient explosives, since these have to be carried on the saddle. Therefore if the demolitions required are extensive

and it is essential that the horses be lightly laden, the party must consist of a larger number of men.

115. *Engineer duties in retreat.*

1. A strong party of engineers should be sent, either with, or ahead of, the advanced guard, to assist in preparing for the defence of such rallying positions as may be selected by the commander of the force. Since a rallying position will have to be occupied quickly by the covering force, and since there may not be much time to arrange for its defence, it is important to take such immediate steps as will help the rapid occupation of the position.

2. The rôle of the covering force will be to gain time, and all engineer work must aim at making the best use of the ground to enable the covering force to achieve this object. The question as to whether this object can best be achieved by utilizing engineer labour for entrenching, etc., or for preparing demolitions, etc., is one which can only be decided by the circumstances of each case. But as a general rule it is only possible to stop a determined pursuit by fighting, and consequently the strengthening of the chief points of a rallying position will generally be of the first importance.

The roads, bridges, etc., by which the enemy may turn the rallying position must be reconnoitred, in order that steps may be taken to delay the enemy's move round the flanks.

3. Other duties of the engineers with the advanced guard in retreat will be :—

- i. The preparation of bridges, etc., for destruction.
- ii. The improvement of the lines of retreat.
- iii. The closing of fords.
- iv. The preparation of obstacles.
- v. The destruction of telegraphs, water supply arrangements, railways, stores, etc., which may be of use to the enemy.

4. It is possible that there will be neither sufficient materials, nor sufficient time, to prepare for extensive demolitions, etc., during a retirement. In this case care must be taken to select the most important items of work, and to concentrate the working parties on them, in order to ensure that they may be effectually carried out.

5. The engineer commander must obtain precise information from the general staff as to which roads, etc., will be used by the troops, and he must also ascertain what bridges, etc., should be destroyed, and what troops have to pass over them before their destruction is completed.

6. In order to ensure the prompt demolition of a bridge, and to make certain that it is not destroyed prematurely, the responsibility for giving the order for firing must be laid on an officer by name. The officer named may be the commander of the covering force, or he may be an officer specially nominated by him. He must be given the fullest information respecting the troops to be expected over the bridge, the time and manner of the withdrawal of the covering force, and be acquainted with orders given to the commander of the guard, or post on the bridge. The demolition party must understand that instruction to fire can be given only by the named officer.

7. A party of engineers should be with the rear guard or with the last body of infantry. With a view to delaying the enemy's advance, the following expedients may be resorted to:—

- i. Narrow roads, etc., can be blocked by broken wagons, etc.
 - ii. Fords can be rendered impassable by throwing in wire, harrows, etc.
 - iii. Boats should be removed to the side of the river further from the enemy, and sunk, or burnt.
 - iv. Villages, heather, scrub, etc., may be set on fire.
 - v. Demolitions can be carried out as time allows.
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CHAPTER X.

NIGHT OPERATIONS.

(See "Field Service Regulations," Part I., Chapter IX.)

116. *Division of night operations.*

1. Night operations may be classified as night marches, night advances, and night attacks.

2. A night march is a march undertaken in the ordinary march formation by night, usually under cover of outposts or covering troops. It may culminate in an attack.

3. A night advance is an advance made by night to gain ground from which further progress will be made in daylight and not to deliver a decisive assault during darkness. Such advances may be used as a preliminary to opening a battle, or to continue an engagement already begun.

4. A night attack is an assault delivered during darkness.

117. *Reconnaissance.*

1. A thorough reconnaissance is an essential prelude to a night advance or to a night attack, and should rarely be dispensed with in the case of a night march.

The engineer reconnaissance must be arranged under the orders of the commander of the force, and, since the necessary preparations may take time to execute, the engineer commander should receive confidential instructions as early as possible. The chief aim of the engineer reconnaissance must be to discover in what way assistance can be given to the other arms, but it is important that it be conducted in such a manner as will not betray the intention of the commander to either friend or foe.

2. The commander having decided the approximate route which should be followed in a night march, an engineer officer should accompany the reconnaissance with the object of investigating the work required as follows :—

- i. The start. To ensure, according to the staff arrangements, that the column can debouch from its quarters in the dark without confusion. This may include the marking of roads with lights, the improvement of turning, cutting gaps, bridging ditches, erecting guard rails to bridges, etc.
- ii. Along the route selected. This may include the making of alternative routes, blocking roads not to be used, erection of sign-posts, laying materials on bridges to deaden noise of traffic, noting places where labour may be required to keep the road in good order, the general compass direction, etc.
- iii. At the termination of the march. This may include preparation as in i. above for the troops to get into quarters, or it may include preparations to facilitate the adoption of the assembly formation, preparatory to an advance.

This reconnaissance should be made both by night and day.

3. When reconnoitring for a night advance it is necessary to consider :—

The marking of the route; the crossing of obstacles; any work which may facilitate the adoption of the assembly formation, or the deployment; sites for trenches at the position of deployment.

4. The following points are of importance when reconnoitring obstacles to a night advance or night attack :—

Their position, nature, and dimensions, and whether they are under fire from the hostile trenches throughout their length; the best way to remove, cut, destroy or cross

them, and the best place to cross them; any gaps in them, and if there are, the arrangements made for keeping these gaps under fire; how they are lit up; the arrangements made for watching their outer edge; their distance from the enemy's trenches.

118. *The employment of engineers during a night march.*

1. The distribution of the engineers during a night march will vary with the circumstances under which the march is executed. If circumstances permit, all the work which has been found by reconnaissance to be necessary should be executed before the march begins; in this case the engineers might be concentrated at the objective of the march, only leaving such parties along the route at bridges, fords, etc., as may be necessary.

2. If, for any reason such as secrecy, it is not advisable to undertake any work previous to the march, then the engineers should march as near the head of the columns as possible. They might with advantage be told off by the commander of the engineers into parties complete with all tools and materials for each piece of work found by reconnaissance to be necessary. In this way all delay due to detailing working parties might be reduced to a minimum.

3. Should it have been impossible previously to reconnoitre the route, then the engineers must be with the advanced guard, ready to undertake whatever work may be necessary. In this case engineer reconnaissance parties must be as far to the front as permissible in order to ascertain what is required and to enable working parties to be detailed quickly.

119. *The employment of engineers during a night advance.*

1. In distributing the engineers for a night advance, their subsequent employment in any engagement which the com-

mander may contemplate should be considered. If their services are not needed immediately after the advance for further operations they may be required to facilitate the march of the attacking force, and their distribution for such work would be settled in accordance with the considerations mentioned in the preceding section.

2. It may be advisable that the objective of the advance when gained should be entrenched so that it may afford a point of support to further progress in daylight. This work, if required, must be begun under the orders of the commander immediately the objective is reached.

3. Engineers should, as far as possible, carry all necessary tools and materials on the person. It is highly undesirable that animals should accompany a night advance.

120. *Employment of engineers in a night attack.*

1. The chief work of the engineers in a night attack will be the removal of obstacles, the maintenance of communications, and assistance in the preparation of the position for defence, when captured.

2. The engineers told off for the destruction of obstacles* should be with the scouts ahead of the assaulting force, ready to get to work at once. The success of their work on the obstacles will depend greatly on the results of the reconnaissance, and all arrangements must have been made as regards the carriage of explosives, cutting tools, grapnels, planks, light bridges, etc. Each party must know exactly what it has to do, and all possible precautions must be taken to endeavour to strike the obstacle at the point selected. Since the assaulting column may be unable to advance until the obstacle has been removed the engineers must continue their work regardless of

* See "Manual of Field Engineering," Sec. 48, for notes on destruction of obstacles.

loss. When a passage has been made through the first line of obstacles the engineers must continue to advance with the leading troops in case their services may be required on a second line.

3. The engineers told off to assist in the preparation of the captured position for defence, and the working parties with tools, should move with the third line or reserve. They should push up directly the position is captured and at once commence work as may be required. The rapid execution of the work is important because it may be expected that the enemy will endeavour to retake the position as soon as possible.

APPENDIX I.

Field works courses for engineer units.

1. During the annual course of instruction in field works the following should be amongst the subjects dealt with:—

Subject.	Reference to text book. —— (" Military Engineering.")
FIELD DEFENCES.	Part I (1908).
Field geometry	Section 3.
Gabions, fascines, and brushwood work	,, 5.
Revetments	,, 6.
Hasty field defences	,, 7 and 8.
Obstacles	,, 11.
Field redoubts	,, 4 and 9.
Stockades, blockhouses	,, 13.
Improving existing cover and defence of buildings, villages, and woods ...	,, 10, 14, 15, and 16.
Communications	,, 12.
Defence of posts and camps ...	,, 17.
ATTACK AND DEFENCE OF FORTRESSES.	Part II (1910).
Trench work	Section 4.
Batteries	,, 2.
Sapping	,, 5.
The assault	,, 6.
Escalading	,, 7.

Subject.	Reference to text book. ("Military Engineering.")
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MINING.	Part IV (1910).
Subterranean warfare	Section 1.
Shafts and galleries	" 2.
Ventilation and lighting	" 4.
Preparing and firing mines	" 5, 6, 7, 8.
DEMOLITIONS.	Part IV (1910).
Boring and blasting	Section 9.
Explosives	" 10.
Deliberate demolitions	" 11, 12.
Hasty demolitions	" 11, 12.
BRIDGING.	Part IIIA (1913).
Knotting, splicing, and lashing	Section 4.
Blocks and tackles	" 5.
Spare and hoisting gear	" 5.
	Part IIIB (1914)
Pontoon bridges	Section 7.
Bridges of boats, casks, and other floating materials	" 7, 14.
Rafts and flying bridges	" 8.
Trestle and pile bridges	" 10.
Suspension bridges	" 11.
Frame bridges	" 12.
Tension bridges	" 12.
Hasty railway bridges	" 13.

Subject.	Reference to text book. (“ Military Engineering.”)
MISCELLANEOUS.	Part V (1907).
Encampments	Section 1.
Hutting	” 2.
Water supply	” 4 to 7.
Roads	” 9.
RAILWAYS.	Part VI (1904).
Plate-laying, repairing, and laying light lines.	Part I.

2. The course of instruction should be continuous, and the whole unit should be instructed at the same time, the men being taken off all other duties* which would interfere with it.

The whole strength of each unit is to go through the course annually (except in Survey Companies in which it will be carried out biennially), and no unit to which the military engineering course applies, or any non-commissioned officer or man of such unit, is to be exempted from the course, without the previous sanction of the general officer commanding-in-chief (*see also* King's Regulations), except specialists who are actually required

* This applies to divisional engineers or army troops. In the case of fortress companies every effort should be made to put the whole company through the course at one time, but if this is impossible the company may be put through by half companies.

to remain in charge of engines and machinery. No N.C.O. or man is to be so exempted in two consecutive years.

Men on command should, if practicable, be exercised with the units to which they are attached.

Cases in which, owing to sickness or other unforeseen and unavoidable cause, it has been impossible to put individual men through the course, will be specially reported on in the annual return of instruction in military engineering.

All mounted non-commissioned officers (except in the field squadron and field troops) are, on appointment, to go through a short course of instruction in military engineering. The course will last 15 days and will include :—

Field geometry, use of field level, measuring width of rivers, laying out trenches.

Hasty entrenchments.

Obstacles and defences.

Bridging.

Arrangements for quartering.

Demolitions.

These non-commissioned officers except the companyserjeant-majors and company quartermaster-serjeant of the Training Depôt for field units should also go through half the annual course with their units.

3. The course will be carried out under the officers of the units, who will be responsible that it is in accordance with the principles contained in "Military Engineering." In regard to the annual course, the following instructions should be observed :—

- i. Before the course commences, lectures should be given to non-commissioned officers on the subjects of the course,
- ii. During the course, short lectures on the day's work should be given to the whole unit before commencing.

- iii. Particular attention should be given to night work in field defences and bridging.
- iv. In view of the desirability of giving every man instruction in siege warfare, sapping and mining should be carried out continuously by reliefs for the time allotted. In any case sapping and mining by night should be practised.

The course should when possible be carried out in accordance with some general tactical idea and in conjunction with other arms as the divisional commander may direct. Officers should be given opportunities of applying their knowledge to actual conditions on the ground, and should be practised in working out schemes of engineer reconnaissance, defence, etc., which should include estimates of strength of working parties, tools required, etc.

The making of works on reduced scales is forbidden.

Non-commissioned officers above the rank of 2nd corporal need not be required to take part in any instruction involving simple manual labour further than that they will superintend and instruct the men.

4. Reports on the field works course will be rendered in accordance with the instructions given in Appendix II.

5. In cases of drafts sent abroad, and from one station to another abroad, a statement showing whether the N.C.Os. and men have been put through the course for the current year should accompany their documents.

APPENDIX II.

Instructions for rendering reports on field works courses.

1. During the field works course a return, on A.F. B 2094, of the instruction of each non-commissioned officer and man is to be kept by the officer commanding the company. On the conclusion of the course, this return will be submitted through the C.R.E. to Commandant, S.M.E., who will, after adding his remarks, return the report to the general officer commanding-in-chief of the command concerned.

2. Instructions for compiling the report are contained in A.F. B 2094.

3. A considerable number of failures occur in the demolition practices during the annual courses of military engineering. In order that the causes may be detected, it is necessary that full information be given in the column for remarks on A.F. B 2094, careful details being especially recorded in all cases of failure on the part of either fuses, detonators, or charges.

Unless there are special reasons to the contrary, the charges used should be those given in "Military Engineering," Part IV. Very often arbitrary charges are used, and the reported failures give no lessons of value.

(NOTE.—No reference to drill movements is made in this Index. Headings of sections dealing with drill will be found in the contents.)

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